AN INVITATION TO COMMENT ON THIS PUBLIC ENVIRONMENTAL REVIEW

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. If you are able to, electronic submissions emailed to the EPA Service Unit project officer would be most welcome.

CSBP Limited proposes to expand its existing Ammonium Nitrate Production Facility, located within the CSBP Kwinana industrial complex, through a combination of options involving debottlenecking of existing plants, duplication of plants and replacement of plants. In accordance with the Environmental Protection Act, a Public Environmental Review (PER) has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from 14 February 2005 closing on 14 March 2005.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in the EPA’s report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the PER:

- clearly state your point of view;
Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

• attempt to list points so that issues raised are clear. A summary of your submission is helpful;
• refer each point to the appropriate section, chapter or recommendation in the PER;
• if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering; and
• attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

• your name;
• address;
• date; and
• whether and the reason why you want your submission to be confidential.

Information in submissions will be deemed public information unless a request for confidentiality of the submission is made in writing and accepted by the EPA. As a result, a copy of each submission will be provided to the proponent but the identity of private individuals will remain confidential to the EPA.

The closing date for submissions is: 14 March 2005

Submissions should ideally be emailed to graham.storey@environment.wa.gov.au

OR

to:

Environmental Protection Authority
PO Box K822

OR

Westralia Square
PERTH 141 St George’s Terrace
WA 6842 PERTH WA 6000
Attention: Graham Storey.
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1. INTRODUCTION

1.1 The Proposal

1.1.1 Proposal Overview

CSBP Limited (CSBP), part of the Wesfarmers Limited group, proposes to expand its existing Ammonium Nitrate Production Facility, located within the CSBP Kwinana industrial complex, through a combination of options involving debottlenecking of existing plants, duplication of plants and replacement of plants.

The existing Ammonium Nitrate Production Facility at the CSBP Kwinana industrial complex consists of the following:

- nitric acid plant;
- ammonium nitrate solution plant;
- ammonium nitrate (nominal 90% solution) storage tank of 730 m$^3$ capacity (900 tonnes of 100% ammonium nitrate);
- prilling plant;
- packaging area;
- combined bulk and bagged ammonium nitrate solids storage area; and
- despatch area.

The existing Ammonium Nitrate Production Facility produces on average 235,000 tonnes per annum (tpa) of ammonium nitrate as solution and prill (solid). Approximately 200,000 tpa of ammonium nitrate is sold to the mining industry in Western Australia (WA) and the remainder is either exported to the east coast mining market or used in liquid fertiliser production in WA.

The ammonium nitrate and nitric acid plants were commissioned in 1996 and the prilling plant was commissioned in 1968.

1.1.2 Proposal Location

The CSBP Kwinana industrial complex is located within the Kwinana Industrial Area (KIA), approximately 40km south of Perth, Western Australia (Figure 1). The entire CSBP Kwinana complex encompasses an area of 138 hectares. BP Kwinana is located to the north, Cockburn Sound to the west and a railway corridor to the east of the CSBP industrial complex.

1.1.3 Proposal Schedule

Construction works on the Ammonium Nitrate Production Facility expansion are proposed to commence (pending necessary approvals) in late 2005 with expected completion in the first quarter of 2007. Recommendations arising from the Environmental Protection Authority’s assessment of this proposal and Ministerial Conditions of approval will be accommodated in project implementation.
1.2 The Proponent

1.2.1 Proponent Contact Details

The proponent for the Ammonium Nitrate Production Facility Expansion Project is:

CSBP Limited
Kwinana Beach Road
Kwinana 6167.

The key contact is:

Cameron Schuster
Manager – Environment & Manufacturing Support
CSBP Limited
Tel: 08-9411 8234
Fax: 09-9411 8233
E-mail: cameron.schuster@csbp.com.au

1.2.2 Proponent Background

CSBP, part of the Wesfarmers Limited group, is one of Australia’s largest manufacturers and suppliers of high quality fertilisers and industrial chemical products. CSBP employs approximately 550 personnel at its Kwinana industrial complex and Bunbury, Albany, Geraldton, and Esperance facilities, with smaller distribution depots being located at Corrigin, Dalwallinu, Goomalling, Merredin, Tambellup and Wagin. The majority of the CSBP workforce is employed at the Kwinana industrial complex located approximately 40km south of Perth. In addition, CSBP in conjunction with Dyno Nobel Asia Pacific own Queensland Nitrates Pty Ltd (an ammonium nitrate business) in Queensland as a 50:50 joint venture.

CSBP manufactures and/or distributes over 1,000,000 tonnes of fertiliser products and approximately 700,000 tonnes of chemicals annually. CSBP produces a porous grade ammonium nitrate for use in the mining industry and a range of other ammonia based industrial chemicals that are distributed for non-fertiliser and fertiliser use.

The chemical and fertiliser manufacturing operations at the CSBP Kwinana industrial complex currently include the following plants:

- ammonia plant;
- nitric acid plant;
- ammonium nitrate solution plant;
- ammonium nitrate prilling plant;
- chlor-alkali plant (for the production of chlorine);
- sodium cyanide plant;
- superphosphate plant;
- compound fertiliser granulating plant; and
- liquid fertiliser plant, which includes the manufacture of Flexi-N.
1.3 This Public Environmental Review Document

1.3.1 Purpose of this Document

This proposal to expand the Ammonium Nitrate Production Facility at the CSBP Kwinana industrial complex was referred to the Environmental Protection Authority (EPA) in August 2004 (CSBP Limited, 2004). The EPA determined that the proposal raised a number of significant environmental factors sufficient to warrant formal assessment under the provisions of the Environmental Protection Act 1986 and subsequently set the level of assessment for the project as a Public Environmental Review (PER), as requested by CSBP. This level of assessment is typically applied to proposals of local or regional significance that raise a number of significant environmental factors, some of which are considered complex and require detailed assessment to determine whether approval should be granted, and if so how potential environmental impacts will be managed.

For proposals where the level of assessment has been set as a PER, the proponent is required to prepare an environmental scoping document. This document is required to include a summary description of the proposal, a preliminary impact assessment and a scope of works setting out the proposed environmental and other surveys/investigations to be undertaken as part of the environmental impact assessment for the preparation of the PER.

CSBP submitted the scoping document to the EPA in early November 2004 and the EPA accepted the document and specifically, the proposed scope of works, on 18 November 2004.

A PER is a public document, and for this proposal, is subject to a four week public review period, during which time the public, stakeholders and other interested groups are invited to make submissions to the EPA, which in turn have to be responded to by the proponent. The EPA will then submit its report and recommendations to the Minister for the Environment on the environmental acceptability of the proposal along with any environmental conditions, which should apply if the proposal is to proceed.

The EPA’s report will be published in the form of a Bulletin and the public may appeal to the Minister against the recommendations or content of the report. The Minister for the Environment will assess any appeals received and ultimately determine whether or not the project can proceed. If the Minister determines that the project can proceed, legally binding conditions, detailing the environmental requirements within which the proponent will have to comply, will be set pursuant to Section 45 of the Environmental Protection Act 1986.

1.3.2 Structure of Document

This document aims to identify and assess the environmental effects of the proposal and to describe the management strategies the proponent will adopt to manage and minimise any adverse environmental impacts. The document provides the following information:
1.4 Management Commitments

CSBP is committed to ensuring that the expansion will be undertaken in a manner to minimise impacts on the surrounding biophysical and social environments.

The implication of the proposed Ammonium Nitrate Production Facility expansion for each of the environmental factors is summarised in Table 29. The proponent has made a number of commitments in this PER to minimise the environmental impact of this development. A summary of these commitments is provided in Table 30.

1.5 Sustainability

The United Nations Industrial Development Organisation (UNIDO) defines sustainable industrial development as:

“...a pattern of development that balances a country’s concerns for competitiveness, social development and environmental soundness either absolutely or comparatively.”

According to the UNIDO, such development accomplishes three things:

- Encourages a competitive economy, with industry producing for the domestic as well as the export market.
- Increases productive employment, with industry bringing long-term employment and increased prosperity.
• Protects the environment, with industry efficiently utilising non-renewable resources, conserving renewable resources and remaining within the functional limits of the ecosystem (UNIDO, 1998).

The first comprehensive policy relating to ecologically sustainable development in Australia was the National Strategy for Ecologically Sustainable Development (NSESD) (Environment Australia, 1992). The Commonwealth and all States and Territories in Australia adopted the NSESD in 1992.

In 2003, the WA government released Hope for the Future: the Western Australian State Sustainability Strategy (Government of Western Australia, 2003, p274). This Strategy outlined the WA government’s approach to eco-efficiency and industrial ecology. Specifically the Strategy states:

“Industrial ecology involves better planning, design and management of industrial activity, so that material, energy and water is not wasted and industrial opportunities are maximised. Industrial ecology requires a completely different approach to industrial development, where industrial facilities are planned, designed and managed to mimic ecological processes.”

Subsequent to the release of the Western Australian State Sustainability Strategy the EPA published a revised Position Statement “Towards Sustainability” (EPA, 2004a) which attempts to describe appropriate approaches to this complex and evolving subject in WA, where mining, petroleum and agriculture are mainstays of our economy, and underpin the standard of living generally enjoyed by Western Australians. The EPA Position Statement contains a useful provisional checklist of questions to be asked when considering proposals. The checklist and CSBP’s responses are presented in Table 1.

### TABLE 1
SUSTAINABILITY CHECKLIST FOR THE PROPOSED AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION

<table>
<thead>
<tr>
<th>Question</th>
<th>Proposal</th>
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<tbody>
<tr>
<td>Does the proposal deplete non-renewable resources significantly?</td>
<td>No</td>
</tr>
<tr>
<td>Does the proposal deplete assimilative capacity significantly?</td>
<td>No</td>
</tr>
<tr>
<td>Does the proposal use natural resources responsibly?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal satisfactorily restore any disturbed land?</td>
<td>N/A</td>
</tr>
<tr>
<td>Does the proposal follow the waste hierarchy and manage satisfactorily any waste produced?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal incorporate best practice in water and energy efficiency?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal make good use of best practice to prevent pollution?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal increase use of non-renewable transport fuels?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal use energy efficient technologies?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal result in net improvements in biodiversity?</td>
<td>No</td>
</tr>
<tr>
<td>Does the proposal increase greenhouse gas emissions?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal involve acceptable levels of risk?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal have a secure foundation of scientific understanding of its impacts?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal minimise the ecological footprint?</td>
<td>Yes</td>
</tr>
<tr>
<td>Question</td>
<td>Proposal</td>
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<tr>
<td>Does the proposal avoid or minimise adverse impacts and promote beneficial impacts on the surrounding community?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal produce sustainable net economic benefits?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal produce sustainable net social benefits?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal add to heritage protection and provide a sense of place?</td>
<td>No</td>
</tr>
<tr>
<td>Does the proposal produce net environmental benefits?</td>
<td>Yes ¹</td>
</tr>
<tr>
<td>Does the proposal contribute to a more equitable and just society?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal interact positively with other likely developments?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the proposal provide new opportunities (social, economic or environmental)?</td>
<td>Yes</td>
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Notes:
Checklist sourced from EPA (2004a)
¹ The net environmental benefits can be gained if the proposal is considered against a background of imports in the event this proposal does not proceed.

Justification and explanation for the CSBP responses provided in Table 1 are presented below.

CSBP, as an important part of the State’s industrial base plays a big role in supporting the mining and agricultural industries, and as described in Section 2.1.1 this proposal has large benefits for both sectors. Whilst the natural gas used to produce ammonia is in human time scales a non-renewable resource, the EPA Position Statement takes the view that these resources need to be used efficiently, and without at source environmental harm – CSBP supports this view.

With regard to the environmental impact of this proposal CSBP is of the view that it has put forward responsible plans to protect the surface water, air shed, and water resources of the Kwinana/Rockingham environment (in all cases ensuring the environmental impact is within the relevant ambient standards, and that CSBP have systems in place to ensure ongoing performance). With respect to water resources CSBP was recently awarded the State Environment Award for Water Management and Conservation by the Premier’s Water Foundation. This award was recognition of CSBP’s commitment to source diversity, source monitoring and protection, recycling, and using water of a quality appropriate to the planned use. CSBP will maintain these commitments into the future.

CSBP has also been heavily involved in the Kwinana Industries Synergies Project since its inception. The Hope for the Future: the Western Australian State Sustainability Strategy (Government of Western Australia, 2003) describes the Kwinana Synergies Project – Industry Sustainability Innovation as one of the best examples in the world of industrial ecology. For the past fifteen years the Kwinana Industries Synergies Project (or its preceding component parts) has been working with industry and the community in Kwinana to create collaborative arrangements to:

- convert wastes into value added products;
- reduce generation of wastes;
- reduce greenhouse gases by improved energy efficiencies;
- reduce freshwater, reuse treated wastewater; and
- reduce effluent discharges into Cockburn Sound.
CSBP regards its water management activity as one of continual improvement, to both protect the resource, and ensure greater value and efficiency is gained from the use of the resource.

The social and economic benefits of this proposal are noted elsewhere in this PER. It is clear that the proposal will deliver significant benefits to the State by way of employment, economic activity, security of supply for resource inputs, and import replacement (with potentially export income) and CSBP is committed to delivering these benefits, whilst ensuring the protection of the environment and the States resources.

CSBP remains committed to working in relevant forums to develop the concept of sustainability, and its varied meanings and implications for Western Australia, whilst recognising this is a very broad and by its nature ongoing discussion.

1.6 CSBP Environmental Management System and Procedures

CSBP has in place an Environmental Management System (EMS), which is consistent with the international standard ISO 14001. The CSBP EMS assists in the management of environmental compliance tasks through an electronic reminder system and in recording actions taken in relation to CSBP environmental risks. Table 2 provides an overview of the CSBP EMS procedures.

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<td>Internal systems auditing</td>
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<tr>
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<td>Describes procedure for skill analysis and training requirements and management of training</td>
</tr>
<tr>
<td>Environmental Approvals and Licensing</td>
<td>Describes environmental approval and licensing requirements and management</td>
</tr>
<tr>
<td>Environmental Compliance Register</td>
<td>Register of legal aspects pertaining to the CSBP activities</td>
</tr>
</tbody>
</table>

CSBP also has in place a Kwinana Environmental Quality Assurance Program, which details the procedures for the management and monitoring of the Ammonium Nitrate Production Facility as well as all the other facilities within the Kwinana industrial complex, to protect the environment in the event of an incident. The procedures included in the Kwinana Environmental Quality Assurance Program that are directly relevant to the Ammonium Nitrate Production Facility are presented in Table 3.
### TABLE 3
AMMONIUM NITRATE PRODUCTION FACILITY ENVIRONMENTAL PROCEDURES

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Pollution Control</strong></td>
<td></td>
</tr>
<tr>
<td>Collecting Groundwater Samples from Monitor Bores</td>
<td>Describes collection and preservation of groundwater samples</td>
</tr>
<tr>
<td>Spill Response Guideline</td>
<td>Pollution Prevention</td>
</tr>
<tr>
<td><strong>Marine Pollution Control</strong></td>
<td></td>
</tr>
<tr>
<td>Wastewater Management</td>
<td>Guide to industrial complex water management</td>
</tr>
<tr>
<td>Management of Licensed Wastewater Sampling and Monitoring Points</td>
<td>Outlines appropriate operation of the monitoring points</td>
</tr>
<tr>
<td>Monitoring Station Actions and Alarms</td>
<td>Response to abnormal conditions</td>
</tr>
<tr>
<td>Maintenance and Calibration of Wastewater Monitoring Point Systems</td>
<td>Data reliability and equipment maintenance</td>
</tr>
<tr>
<td>Sampling of Licensed Wastewater Monitoring Points</td>
<td>Describes sampling techniques</td>
</tr>
<tr>
<td>Marine Pollution Control</td>
<td>Pollution Prevention</td>
</tr>
<tr>
<td><strong>Sample Handling</strong></td>
<td></td>
</tr>
<tr>
<td>Collection of Surface Water Samples</td>
<td>Sampling and handling of surface water</td>
</tr>
<tr>
<td>Cleaning and Labelling of Sample Bottles</td>
<td>Sample handling techniques</td>
</tr>
<tr>
<td>Preservation of Environmental Water Samples</td>
<td>Describes appropriate type and method of sample preservation</td>
</tr>
<tr>
<td><strong>Waste Management</strong></td>
<td></td>
</tr>
<tr>
<td>Waste Management Plan</td>
<td>Overview of waste management system</td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>Management, disposal and storage of solid waste</td>
</tr>
<tr>
<td>Liquid Waste Management</td>
<td>Management, disposal and storage of liquid waste</td>
</tr>
<tr>
<td><strong>Integrated Ammonium Nitrate And Nitric Acid Plant</strong></td>
<td></td>
</tr>
<tr>
<td>NOx Monitoring on the Nitric Acid Plant Stack During Start-Up</td>
<td>Describes the conditions, monitoring and calculations for NOx monitoring at start-up</td>
</tr>
<tr>
<td>Continuous NOx Monitoring on the Nitric Acid Plant Stack</td>
<td>Describes the instrumentation and maintenance of the NOx monitors</td>
</tr>
<tr>
<td><strong>Ammonium Nitrate Prilling Plant</strong></td>
<td></td>
</tr>
<tr>
<td>Use of Auto-Isokinetic Sampler on the Prilling Plant Exit Stacks</td>
<td>Describes the procedure for the measurement of particulate ammonium nitrate</td>
</tr>
<tr>
<td><strong>Data reliability and Reporting</strong></td>
<td></td>
</tr>
<tr>
<td>Calibration and Maintenance of Environmental Equipment</td>
<td>References equipment calibration procedures</td>
</tr>
<tr>
<td>Three Monthly Reporting of Gas Emissions</td>
<td>Data checking and reporting to DoE</td>
</tr>
<tr>
<td>Environmental Reporting</td>
<td>Describes data reporting requirements</td>
</tr>
</tbody>
</table>

The procedures included in the Kwinana Environmental Quality Assurance Program are reviewed when changes occur which affect specific procedures, every three years or as required by the CSBP document management system.

CSBP will also, to the satisfaction of the Department of Industry and Resources (DoIR), continue to maintain a Safety Report for the Ammonium Nitrate Production Facility as described under the National Standard for the Control of Major Hazard Facilities [NOHSC:1014 (2002)], as required by the Facility’s Dangerous Goods Licence, and other relevant legislation. This provides the framework to ensure that the Facility emergency response and management systems are appropriate to maintain public safety.
2. PROJECT JUSTIFICATION AND EVALUATION OF ALTERNATIVES

2.1 Project Justification

2.1.1 Benefits to Western Australia

The mining and agricultural sectors are significant contributors to the WA economy making up approximately 20% and 3.4% of WA’s gross state product respectively (CME, 2004) (ABS, 2002). The mining sector in WA relies on quality ammonium nitrate product of which CSBP currently supplies approximately 95%. In addition, there is a growing demand from the agricultural sector for liquid fertilisers such as Flexi-N (manufactured at CSBP from ammonium nitrate solution and urea).

Western Australian demand for ammonium nitrate products is rapidly increasing to service the growing mining and agricultural requirements. Projections of ammonium nitrate consumption in WA indicate that by 2007/08, ammonium nitrate demand in the mining and agricultural sectors will reach a total of 390,000 tpa.

CSBP has recognized that the current and predicted market demand is sufficient to justify the expansion of its existing production capacity. The proposed expansion will offer an alternative to current practices where ammonium nitrate is manufactured overseas or interstate and imported to meet market demand in both the agricultural and mining sectors.

Through the proposed duplication of the nitric acid and ammonium nitrate plants, and installation of a new, larger prilling tower at the Kwinana industrial complex, CSBP will be able to provide up to a further 100,000 tpa of excess production for other export markets or to service a greater than projected growth in demand for ammonium nitrate in WA.

WA’s agricultural and mining sectors will be able to rely on the security of supply of a locally produced, high quality ammonium nitrate product, manufactured in a facility that is state of art in terms of emission controls when compared to international ammonium nitrate plant benchmarks.

Current local production of ammonium nitrate reduces import requirements with import replacement of $70 million per annum. The project will replace future imports of a similar dollar value, and contribute significantly to the state’s economy with capital expenditure of around $140 million, and new export revenues and employment over the life of the project.

2.1.2 Local Benefits

The expansion will result in the employment of 150 people during the construction phase with an expected additional employment of 20 people (directly and indirectly) required to cover production, maintenance, despatch, sales and distribution of ammonium nitrate from the expanded facility.
2.2 Evaluation of Alternatives

2.2.1 Process Technology

Because this proposal involves the expansion of an existing production facility, albeit through the construction and operation of new plants, and the continuing operation of existing plants, there are limits to the technology CSBP can employ to produce nitric acid and ammonium nitrate.

Primarily these limits apply because technologies should be broadly within the ambit of those in which CSBP has operational and maintenance experience, and where CSBP’s existing procedures and systems can allow for the ongoing safe and environmentally effective operation of the business. For this reason the commitments made in this PER are primarily outcome based (i.e. ensuing safety and high standards of environmental performance), and do not specifically designate the various components of technology to eventually be used.

CSBP is conducting its business feasibility and regulatory approvals processes in parallel, and in this light no final decision on actual technology has been made at the time of PER preparation, but the parameters for technology selection will deliver the various outcomes committed in this PER. At the time of publication of this PER CSBP is actively seeking to finalise the technology choices for this project, and commits to providing them to the EPA within the period that the resulting EPA Bulletin is being prepared. However the environmental outcomes reported here will be achieved as a minimum by the chosen technologies, and CSBP is including issues such as the required emission limits in the requests for technology supply.

However the technologies will have the following general characteristics:

*Nitric Acid*

Nitric acid plants involve the production of NO\(_x\) through mixing ammonia and air over platinum/rhodium gauzes at about 920 °C (an exothermic reaction producing heat to generate electricity). This NO\(_x\) is then passed through the absorber tower (the tallest part of the plant) where it is absorbed in water to create nitric acid (HNO\(_3\)). The residual process gas, containing some NO\(_x\) is then passed through a selective catalytic reduction (SCR) process to convert the NO\(_x\) to N, via reaction with small quantities of ammonia.

Considerable emphasis was placed on minimising environmental impacts and maximising energy recovery as electricity when the existing plant was designed. These features are still at world’s best practice level and will be copied for the new plant. With the SCR technology, the high standard achieved by the existing plant in producing low NO\(_x\) emissions will be maintained with the new plant.

This process is generally described as mono pressure nitric acid production.
Ammonium Nitrate

The nitric acid mixes with ammonia in a pipe reactor under pressure to create ammonium nitrate (NH$_4$NO$_3$). This reaction produces heat used to create low-pressure steam for use elsewhere in CSBP’s production processes.

The ammonium nitrate solution (ANsol) is then transferred to a storage tank before either despatch as a hot liquid for use in the mining industry, or dilution and transfer for use in Flexi-N (liquid fertiliser) manufacture. ANsol is also transferred from the ammonium nitrate manufacture to the prilling plant to create ammonium nitrate prill. One of the significant features of this project will be the reduction in volume (900 to 310 tonnes), and the movement of the high strength ANsol tank further away from some of the major risk contributors on the site.

Prilling Plant

In the prilling plant (which contains a large tower approximately 60m tall) the hot ANsol solution is pumped to the top of the prilling tower and sprayed at 130 °C into the void inside the tower, where it falls under gravity against a fan forced air stream.

The liquid cools as it falls, and creates the small round prill. These prill are then dried, cooled, screened and coated to provide raw material for use in the mining industry.

The air is used to solidify the prills in the tower and to dray and cool these prills. These air streams are scrubbed in an efficient wet venturi to remove the large majority of dust particles before discharge to atmosphere. The water effluent from the scrubber is recycled through the plant to recover the ammonium nitrate.

CSBP is committing to emission levels of ammonium nitrate at 50 mg/Nm$^3$, compared to the current plant licence limits of 100 (for the prill plant tower) to 250mg/Nm$^3$ (for the dryer and pre dryer stacks). The existing prilling plant (if it continues operation) will be retro fitted with a wet scrubber, and will retain the existing cyclones to meet a standard of 100 mg/Nm$^3$ ammonium nitrate emissions. Section 6.4 on ammonium nitrate particulate explains these outcomes more fully. CSBP commits to providing comprehensive details of the technology and plant design once this has been finalised through the licensing and works approval process.

2.2.2 Project Location

CSBP has reviewed a number of location options including:

- establishment of new production facilities overseas;
- establishment of new production facilities at the Burrup Peninsula in the northwest of WA; and
- expanding the existing Ammonium Nitrate Production Facility at the CSBP Kwinana industrial complex.
CSBP studies to date demonstrate that the most economical and flexible solution with the lowest environmental impact is clearly the option of expanding the existing operations at the Kwinana industrial complex.

The existing Kwinana Ammonium Nitrate Production Facility delivers the greatest production flexibility and utilisation of existing internal and external resources established for the wider CSBP operations in WA.

The option for establishing a new facility in the Burrup or overseas is currently not viable in CSBP’s case due to the following factors:

- significantly higher establishment costs;
- greater delays associated with development and construction of the project;
- duplication of certain ancillary facilities that already exist at Kwinana;
- overall higher resultant environmental impacts associated with land acquisition and clearing;
- duplication of organisational overheads required to operate a remote site;
- organisational difficulties associated with remote sites, including the retention of trained technical personnel;
- higher operating costs and duplication of critical spare requirements; and
- reduced synergies between the two operating units impacting on the flexibility of switching product mixes to meet customer demands during peak seasons.
3. LEGISLATIVE FRAMEWORK

3.1 Relevant Legislation and Policies

The existing Kwinana Ammonium Nitrate Production Facility is subject to a range of licences and regulations applying to industry in WA. In addition to gaining environmental approval from the Minister for the Environment, the proponent is required to comply with other legislation. A summary of the key relevant legislation, regulations or local laws is listed below (all are Western Australian state laws, except where otherwise noted).

- Aboriginal Heritage Act 1980;
- Agriculture and Related Resources Protection Act 1976;
- Australian Heritage Commission Act 1975;
- Conservation and Land Management Act 1984;
- Contaminated Sites Act 2003;
- Dangerous Goods Safety Act 2004 (and regulations) (is likely to be proclaimed in 2005);
- Environmental Protection Act 1986 as amended (and relevant Regulations);
- Environmental Protection and Biodiversity Conservation Act (1999), (Commonwealth) (and Regulations);
- Explosives and Dangerous Goods Act 1961 (eventually will be repealed and replaced by the Dangerous Goods Safety Act and Regulations);
- Health Act 1911;
- Local Government Act 1995;
- Main Roads Act 1930;
- Occupational Health and Safety Act 1984 (and Regulations);
- Rights in Water and Irrigation Act 1914;
- Town Planning and Development Act 1928;
- Town of Kwinana Local Laws (several);
- Town of Kwinana, Town Planning Scheme No. 2;
- Water and Rivers Commission Act 1995; and

The proposed expansion will also be referred to the following decision-making authorities for approvals:

- Department of Environment (DoE) for approval under Part V of the Environmental Protection Act 1986;
- DoIR for assessment of the dangerous goods, public risks and hazard aspects of the proposal;
- DoIR for the proposed new national licensing regime for ammonium nitrate use, manufacture, storage, transport, supply, import and export of ammonium nitrate; and
3.2 Previous Environmental Approvals

As this proposal is an expansion of the existing Ammonium Nitrate Production Facility it is relevant to describe the previous environmental approvals.

In March 1993, CSBP & Farmers Ltd. (now CSBP) sought a Works Approval from the then Department of Environmental Protection (DEP) to construct new nitric acid and ammonium nitrate production facilities at its Kwinana industrial complex with sufficient capacity to meet the existing and medium term demand for ammonium nitrate in WA. Approval was granted in May 1993 with a currency of 12 months (Works Approval 936 File No. W44/67/5) (CSBP & Farmers Ltd., 1993).

In July 1994, a further Works Approval application was lodged relating to the same project covering the project to the point of commissioning of new facilities (CSBP & Farmers Ltd., 1994). The proposal was to construct an integrated ammonium nitrate production unit comprising a 500 tonne per day (tpd) nominal capacity nitric acid plant and a 635 tpd nominal capacity ammonium nitrate solution plant along with ancillary water-cooling, product storage, motor control and electrical distribution facilities.

Works Approval No. 1138 was issued by the DEP in September 1994. This allowed for the construction of a new integrated Ammonium Nitrate Production Facility at the CSBP Kwinana industrial complex involving the construction of a new nitric acid plant.

Current operations at the Kwinana industrial complex are subject to environmental conditions prescribed under Environmental Protection Licence number 6107/13 (Appendix 1). The licence includes conditions for the control, monitoring and reporting of air emissions, liquid waste and solid waste.

3.3 National Controls for Ammonium Nitrate (Security Related)

At a meeting on the 25th June 2004 the Council of Australian Governments’ (COAG) agreed on a national approach to ban access to ammonium nitrate for other than specifically authorised users. The agreement will result in the establishment in each jurisdiction of a licensing regime for the use, manufacture, storage, transport, supply, import and export of ammonium nitrate.

The licensing regime will ensure that ammonium nitrate is only accessible to persons who have a demonstrated legitimate need for the product, are not of security concern and will store and handle the product safely and securely. This arrangement will balance security considerations with the legitimate needs of industry and farmers. A national set of principles for regulating ammonium nitrate was developed by COAG.
COAG agreed that the States and Territories would use their best endeavours to ensure that the legislative arrangements for the licensing regime would be in place by 1 November 2004, with administrative arrangements to be finalised as soon as possible thereafter. COAG also noted that the Australian Government would continue to undertake investigations on the viability of completely banning ammonium nitrate fertilisers of security concern as a matter of priority, taking into account whether effective, non-detonable, alternatives can be developed, and provide information on any alternatives to States and Territories.

WA is slightly behind other Australian jurisdictions in developing the required licensing regime as the WA ammonium nitrate security regulations will be part of the totally new Explosives Regulations under the Dangerous Goods Safety Act 2000 (given Royal Assent on 10 Jun 2004 but still to be proclaimed). Draft regulations were expected to be available in December 2004 and proclamation of the whole dangerous goods reform package is expected by mid 2005.

CSBP has been involved in discussions with the DoIR since early July 2004, on the successful implementation of the proposed regulation for the control of ammonium nitrate. CSBP is committed to implementing the controls required for the production and storage of ammonium nitrate within the CSBP industrial complex and the controls required for the transport – when CSBP is responsible for the transport of ammonium nitrate.

3.4 Major Hazard Facilities in Western Australia

3.4.1 Legislative Regulation of Major Hazard Facilities in WA

The CSBP Ammonium Nitrate Production Facility is one of 28 major hazard facilities currently operating in WA.

Major hazard facilities are facilities such as oil refineries, chemical plants and large fuel and chemical storage sites where large quantities of dangerous goods are stored, handled or processed.

Major hazard facilities in WA are currently regulated by the:

• *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.*

The DoIR administers the *Explosives and Dangerous Goods Act 1961* and associated regulations.

The Safety Assessment Section, one of five sections within the Technical Services Branch of the Safety, Health and Environment Division of the DoIR oversees the implementation of the National Standard for the *Control of Major Hazard Facilities [NOHSC:1014 (2002)]*, which has been administratively applied under Section 45C of the *Explosives and Dangerous Goods Act 1961(WA).*

### 3.4.2 Application to the CSBP Ammonium Nitrate Production Facility

Section 6 of the *Control of Major Hazard Facilities National Standard*, which addresses hazard identification, risk assessment and risk control, requires CSBP to carry out, document and continually update a systematic risk assessment for its Ammonium Nitrate Production Facility which as far as practicable:

- identifies all hazards and all events which may lead to a major accident;
- identifies the type, likelihood and consequence of major accidents that may occur; and
- assesses the risks posed by those hazards and events.

Section 6 also requires CSBP to maintain a documented Safety Management System for its Ammonium Nitrate Production Facility, which incorporates details from the risk assessment and other relevant information. The CSBP Safety Management System details actions to:

- eliminate or minimise hazards at the facility;
- implement technical measures to limit the consequence of a major accident; and
- protect people property and the built and natural environment from the effects of a major accident by establishing emergency plans and procedures.

Section 7 of the *Control of Major Hazard Facilities National Standard*, which addresses Safety Reports, requires CSBP to provide to the DoIR a Safety Report. CSBP’s “*Ammonium Nitrate Production Facility Safety Report*” contains the following:

- the nature and scale of use of the hazardous materials by CSBP;
- the type, relative likelihood and consequence of major accidents that might occur; and
• details of the CSBP “Safety Management System” which includes the procedures for the:

• safe operation of the facility including the control of serious deviations that could lead to a major accident and emergency procedures at the site; and

• means to ensure that the procedures for the safe operation of the facility are properly designed, constructed, tested, operated, inspected, and maintained.

• justification as to the adequacy of the measures taken to ensure the safe operation of the facility.

CSBP’s Ammonium Nitrate Production Facility Safety Report is revised, updated, amended and provided to the DoIR as follows:

• prior to operating any modification, which may significantly alter the risk associated with the facility;

• when developments in technical knowledge or in the assessment of hazards and risks make this appropriate;

• at least every five years; or

• when requested by the DoIR.

The Safety, Health and Environment Division of the DoIR has the responsibility of monitoring the ongoing implementation of CSBP’s Ammonium Nitrate Production Facility Safety Report through internal and external audit, inspection and regular meetings with CSBP personnel. The most recent external audit was completed in October 2004.

CSBP is currently working towards finalisation and the DoIR endorsement of the Ammonium Nitrate Production Facility Safety Report and associated documentation to demonstrate the adequacy of the safety measures.

Section 9 of the Control of Major Hazard Facilities National Standard, which addresses emergency planning, requires CSBP to:

• ensure that all persons on-site have appropriate training in the implementation of the emergency plans;

• in consultation with emergency services, formulate and agree to an off-site emergency plan for action outside the facility;

• ensure that an on-site emergency plan for action inside the facility is established and maintained in conjunction with emergency services; and

• consult with the community, including other closely related facilities, during the preparation of off-site emergency plans, where appropriate.
Section 9 also requires CSBP to update the on-site and off-site emergency plans and the information provided to emergency services:

- in conjunction with the updating of the safety report;
- when a major incident, near miss or an effectiveness test the need to do so; or
- at the specific request of the relevant public authority.

CSBP’s participation in the emergency response planning within the KIA and consequently compliance to the emergency planning requirements of the Control of Major Hazard Facilities National Standard is discussed in more detail in Sections 3.5 and 3.6.

### 3.5 Kwinana Industries Mutual Aid (KIMA)

CSBP is a full member of Kwinana Industries Mutual Aid (KIMA) and the overarching Kwinana Industries Public Safety Group (KIPS).

Established in 1990, KIMA ensures that adjacent sites receive early warning of an emergency that may impact upon their site. Prior to 1990, the Kwinana Integrated Emergency Management System (KIEMS) undertook a similar role to that of KIMA.

KIMA, administered by the Kwinana Industries Council (KIC), is a working group of technical specialists from within industries in the KIA who share emergency response expertise and resources in case of a major emergency. KIMA members meet bi-monthly and are directly involved in the maintenance and continual improvement of the KIMA Plan and Resource Manual.

Full members of KIMA are those companies, which are subject to the current Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992 (soon to be replaced by new Dangerous Goods Safety (Storage and Handling) Regulations (incorporating the National Standard for the Storage and Handling of Workplace Dangerous Goods)) and therefore require a Safety Report. The member companies also meet in a policy/liaison forum as the Kwinana Industries Public Safety Group (KIPS), which in turn hosts a public forum called KIPS Liaison Group (see Section 3.6).

Other full members of KIMA are:

- BP Refinery (Kwinana) Pty Ltd;
- Fremantle Ports (not a major hazard facility, but is a core part of KIA activities);
- Nufarm Coogee Pty Ltd – Chlor Alkali Plant;
- Tiiwest Joint Venture;
- Terminals West;
- Wesfarmers Kleenheat Gas;
- Wesfarmers LPG Pty Ltd; and
- WMC Kwinana Nickel Refinery.
The member company concerned initially attends to all incidents within their site, using in-house expertise and emergency response equipment available at or near the site. All member companies hold sufficient equipment and have trained emergency response personnel to cope with foreseeable incidents that may occur on their site. The KIMA Plan is activated when the management of an incident is beyond the capability of the Member Company concerned or when the incident will affect other industries.

### 3.6 Kwinana Industries Public Safety Group (KIPS)

In 1991, a number of major Kwinana industries, including CSBP, formed a mutual aid group to provide a forum, which was focussed on joint industry emergency response and public safety.

In 2002, this structure provided the basis for the establishment of the Kwinana Industries Public Safety Group (KIPS) with the aim of providing a similar cooperative approach on issues relating to community and employee safety and the environment.

KIPS was set up through the KIC in conjunction with a range of key stakeholders including:

- Fire and Emergency Services Authority (FESA);
- WA Police Service (WAPS);
- State Government regulatory authorities;
- Local Councils; and
- Community representatives.

KIPS was designed to address the need for a cooperative and effective approach to managing public safety in the KIA, as well as providing a mechanism for companies to meet their own obligations under the requirements of both the WA Occupational Safety and Health Act 1984 and the requirements of the National Standard for the Control of Major Hazard Facilities.
4. PROPOSAL DESCRIPTION

4.1 Existing Ammonium Nitrate Production Facility

As previously detailed, the existing Ammonium Nitrate Production Facility at the CSBP Kwinana industrial complex consists of the following components:

- nitric acid plant;
- ammonium nitrate solution plant;
- ammonium nitrate (nominal 90% solution) storage tank of 730m³ capacity (900t of 100% ammonium nitrate);
- prilling plant;
- packaging facility;
- combined bulk and bagged ammonium nitrate solids storage facility; and
- despatch facility.

Table 4 presents key characteristics of the existing CSBP Ammonium Nitrate Production Facility.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Kwinana Beach Road – Kwinana – Kwinana Industrial Area (KIA)</td>
</tr>
<tr>
<td>CSBP Site area</td>
<td>138 hectares</td>
</tr>
<tr>
<td>Project Life</td>
<td>20 – 30 years</td>
</tr>
<tr>
<td>Plant Operating Hours</td>
<td>24 hour/day operation, 365 days per year except for maintenance shutdowns</td>
</tr>
<tr>
<td>Plants Commissioned</td>
<td>1968 – prilling plant, 1996 – existing nitric acid plant and ammonium nitrate plant</td>
</tr>
<tr>
<td>Major Plant Facilities</td>
<td>Nitric acid plant, Nitric acid storage tanks, Ammonium nitrate solution plant, Ammonium nitrate (90% solution) storage tank of 730m³ capacity, Prilling plant, Packaging facility; and Ammonium nitrate solids storage facility.</td>
</tr>
<tr>
<td>Production</td>
<td>Nitric acid – average 187,000 tpa; current maximum 200,000 tpa, Ammonium nitrate – average 235,000 tpa, current maximum 254,000 tpa, Prill – average 185,000 tpa, current maximum 200,000 tpa</td>
</tr>
<tr>
<td>Inputs</td>
<td>Ammonia, oxygen and water</td>
</tr>
<tr>
<td>Outputs</td>
<td>Ammonium nitrate solution and prill plus air/water emissions (See below)</td>
</tr>
<tr>
<td>Gaseous Emissions</td>
<td>Nitrogen oxides - 71 tpa, Ammonium nitrate particulate – 104 tpa</td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
<td>667,394 tpa of net CO₂-e</td>
</tr>
<tr>
<td>Liquid Effluent Discharges</td>
<td>Approx 0.5 ML/day of cooling tower blowdown water and stormwater to Cockburn Sound (to the Sepia Depression Ocean Outfall Landline (SDOOL) in February 2005 approx.)</td>
</tr>
</tbody>
</table>
4.2 Proposed Changes to Ammonium Nitrate Production Facility

CSBP proposes to undertake the following changes to the existing Ammonium Nitrate Production Facility:

- Duplication of the nitric acid plant and/or debottlenecking of the existing nitric acid plant.

- Duplication of the ammonium nitrate solution plant and/or debottlenecking of the existing ammonium nitrate reaction plant.

- The existing 730 m$^3$ (90% ammonium nitrate solution) storage tank will be used to store less concentrated (approximately 70%) liquid ammonium nitrate in order to reduce the overall risk profile for the Ammonium Nitrate Production Facility and the CSBP industrial complex as a whole.

- Construction of a new high strength (90%) ammonium nitrate solution tank of reduced capacity (approximately 250 m$^3$ (equivalent to a 310 tonnes tank) of 90% ammonium nitrate solution) will be located further away from the bulk ammonia facility. CSBP will adopt a number of specific design features that will reduce potential impacts from an incident involving the high strength ammonium nitrate solution tank, and hence reduce the overall modelled industrial complex safety risk associated with the current storage arrangement.

- A new prilling plant will be constructed with greatly improved performance in terms of both particulate and aqueous emissions. It is expected that production at the existing plant will be progressively downscaled once the new prilling plant is commissioned. CSBP has recognised that there will be a period of time during the commissioning of the new prilling plant where it will have to run both the existing and the new prilling plant in combination. This will occur while CSBP proves the quality of the ammonium nitrate prill produced by the new plant. The timeframe where both plants will be run together has not yet been determined but it is estimated that the timeframe could be six months to twelve months.

- However, it is also possible that the new prilling plant and the existing prilling plant will have to be operated together for a period of some years. A final decision on the long-term operation of the existing prilling plant will be made based on the performance of the new plant and commercial and market factors. Should the decision be made to continue to run the existing prilling plant CSBP will retrofit appropriate pollution prevention equipment on the existing prilling...
plant to meet a target particulate emission goal of 100 mg/m$^3$. The air shed modelling in this PER includes the two plants running together as the maximum impact air shed case for EPA assessment.

- Currently, the ammonium nitrate solids storage licence is for 14,000 tonnes. CSBP will be applying to the DoIR to vary the existing approval to provide flexibility in the quantity of bagged and solid ammonium nitrate stored at any one time, while maintaining the current maximum storage license of 14,000 tonnes. Additional storage facilities (constructed to appropriate standards) may be established to accommodate flexibility in the quantities of bagged or bulk ammonium nitrate stored onsite prior to despatch.

Due to the uncertainty at the time of writing with respect to the exact option or combination of options that will eventually be constructed and operated, CSBP has committed to the EPA, within the scope of the production scenario outlined for the project, that the most significant option for each environmental or public safety impact will be modelled and/or reviewed in this PER document.

All additional infrastructures for the proposed expansion will be located within the existing CSBP Kwinana industrial complex boundary. Accordingly, there will be no additional land acquisition or disturbance required and no resultant impact on any existing natural flora or fauna habitats.

The new ammonium nitrate production infrastructure will be located within the expansion envelope shown on Figure 2. The exact location of individual plants within the expansion envelope is still to be confirmed and therefore this PER includes the highest impact option for factors such as noise, which are to an extent location dependant. The location of a proposed new transit storage area is also shown on Figure 2. This new storage area will allow CSBP flexibility in the configuration of ammonium nitrate storage while still maintaining the current total storage license of 14,000 tonnes.

Table 5 provides a summary of the proposed key characteristics following the expansion of the Ammonium Nitrate Production Facility compared with the key characteristics of the existing Ammonium Nitrate Production Facility.

### TABLE 5

**KEY CHARACTERISTICS FOR THE PROPOSED EXPANSION OF THE CSBP AMMONIUM NITRATE PRODUCTION FACILITY COMPARED WITH EXISTING FACILITY**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Existing Facility</th>
<th>Description of Expanded Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Kwinana Beach Road – Kwinana – Kwinana Industrial Area (KIA).</td>
<td>Kwinana Beach Road – Kwinana – Kwinana Industrial Area (KIA) – no change</td>
</tr>
<tr>
<td>CSBP Site Area</td>
<td>138 hectares</td>
<td>138 hectares – no change</td>
</tr>
<tr>
<td>Project Life</td>
<td>20-30 years</td>
<td>20-30 years – no change</td>
</tr>
<tr>
<td>Plant Operating Hours</td>
<td>24 hour/day operation, 365 days per year except for maintenance shutdowns</td>
<td>24 hour/day operation, 365 days per year except for maintenance shutdowns – no change</td>
</tr>
</tbody>
</table>
### Characteristic

<table>
<thead>
<tr>
<th>Existing Facility</th>
<th>Description of Expanded Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production Plants</strong></td>
<td>Nitric acid plant; Nitric acid storage tanks Ammonium nitrate plant; Ammonium nitrate (90% solution) storage tank of 730 m³ capacity; Prilling plant; Packaging and despatch facilities; and 14,000 tonnes bulk and bag storage.</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>Nitric acid – average 187,000 tpa, maximum 200,000 tpa Ammonium nitrate - average 235,000 tpa, maximum 254,000 tpa Prilling plant – average 185,000 tpa, maximum 200,000 tpa</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td>Ammonia, oxygen, and water</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>Ammonium nitrate solution and prill plus air/water emissions (see below)</td>
</tr>
<tr>
<td><strong>Gaseous Emissions</strong></td>
<td>Nitrogen oxides - 71 tpa Ammonium nitrate particulate – 104 tpa</td>
</tr>
<tr>
<td><strong>Greenhouse Gas Emissions</strong></td>
<td>667,394 tpa of net CO₂-e</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Existing Facility</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Liquid Effluent</td>
<td>Approx 1.5 ML/day of cooling tower blowdown water and stormwater to Cockburn Sound (to the SDOOL in February 2005 approx)</td>
</tr>
<tr>
<td>Noise</td>
<td>CSBP industrial complex does not currently meet the industry to industry assigned level of the Environmental Protection (Noise) Regulations</td>
</tr>
<tr>
<td>Net Power Generation</td>
<td>1.5MW</td>
</tr>
</tbody>
</table>

4.3 Process Descriptions

As some of the chemical reactions used in the processes described below are exothermic in nature significant quantities of energy in the form of heat are released. Heat recovered from these processes currently generates approximately 3.5 MW (mega watt) of electricity, 2 MW of this is utilised within the facility, leaving approximately 1.5 MW for use elsewhere within the CSBP Kwinana industrial complex. It is anticipated that with the duplication of the nitric acid and ammonium nitrate plants the 1.5 MW for use elsewhere within the CSBP Kwinana industrial complex will also double to 3.0 MW.

A production flow diagram illustrating the steps involved in the production and distribution of ammonium nitrate is presented as Figure 3.

4.3.1 Nitric Acid Production

The nitric acid plant uses ammonia and air as raw materials. Liquid ammonia supplied to the process from the ammonia plant distribution system is vapourised in an ammonia evaporator and superheater under pressure control.

The pressure of the ammonia is reduced prior to mixing with compressed air. The flow rate of the process air to the ammonia air mixer is measured and used as an input to determine the flow rate of ammonia into the mixer.

The ammonia/air mixture is fed to the ammonia burner where the mixture is reacted catalytically over gauzes lying across the flow in the burner. The reaction product is a mixture of oxides of nitrogen.

After leaving the burner the reaction products are passed through the waste heat boiler, the tail gas heater, the primary air heater, the economiser and the gas cooler.
condenser and separator. The mixture is cooled to about 60 °C resulting in production of weak nitric acid solution, which is separated out and fed as weak nitric acid into the absorption tower. The product acid, at 62% strength, flows out from the bottom of the absorption tower to storage tanks. Waste gases from the process are treated in a selective catalytic reactor (SCR) to reduce the oxides of nitrogen to within acceptable limits. All wastewater generated in the process is collected and tested before recycling or discharge into the site wastewater disposal system.

At Kwinana, the majority of nitric acid produced is converted into ammonium nitrate.

### 4.3.2 Ammonium Nitrate Production

The ammonium nitrate plant uses liquid (62%) nitric acid and gaseous ammonia as raw materials. The nitric acid and ammonia react immediately in the pipe reactor and flow into the reactor separator/demister. Nearly all of the water in the nitric acid solution is evaporated by the heat of the reaction and separated out of the 96% w/w ammonium nitrate solution as process steam.

The ammonium nitrate solution flows under gravity into the ammonium nitrate solution tank. This tank operates at atmospheric pressure and 157 °C. The process steam is scrubbed and acidified. Approximately 40% of the process steam flows to a number of heat exchangers, all of which return the condensate to the concentrated process condensate tank. The remaining 60% of the process steam flow passes to the process condensate evaporator where it is used to evaporate a portion of the concentrated process condensate and produce steam. The condensate is pumped to the nitric acid absorber. The pH of the circulating liquid is controlled by the addition of 62% w/w nitric acid.

About 30% of the clean steam passes to two heat exchangers, which return the clean condensate to storage. The clean condensate is sent to the cooling water system. All wastewater generated in the process is collected and tested before recycling or discharge into the site wastewater disposal system.

### 4.3.3 Ammonium Nitrate Prills

Liquid ammonium nitrate is converted into small drops, which when cooled form a solid sphere referred to as ‘prill’.

The process of prill production involves liquid ammonium nitrate and the following additives:

- Aluminium sulphate (alum) solution (strengthens the finished prill);
- Nitric acid (helps alum achieve strength);
- Ammonia (raises pH);
- Coating agent (amine in oil) to prevent caking of finished product; and
- Heat generated by saturated steam at a maximum pressure of 1500 Kpa.

Ammonium nitrate, alum and nitric acid are mixed to ensure homogeneity in a melt tank. Ammonia is added to the mixture to adjust the pH to about 5.5 and the
combined solution is sent to the prilling tower. The ammonium nitrate mixture is concentrated through evaporation from 92% w/w to 95% w/w.

The ammonium nitrate solution is passed into a spinning bucket with specified pore holes through which the solution flows. The solution droplets coming out of the prill bucket are now referred to as prills and these fall to the bottom of the prill tower. The flow of ambient air cools and solidifies the prills during their fall. The prills are then dried, cooled, screened, coated and weighed.

Prills that are out of specification go to the ammonium nitrate recycle system. In specification prill is conveyed to the storage bin for despatch. The ammonium nitrate recycle system takes solids from the cyclones (dust) and screens for redissolving and drum washing from the regular plant cleanings and recycles these materials into the product. Potentially contaminated product such as floor washings and solidified spills are recovered and sent to the wastewater storage tanks for reuse in other plants.

4.3.4 Ammonium Nitrate Despatch

After manufacture, the product is stored at the CSBP Kwinana industrial complex and is then despatched by road to mine sites or other consumers. It is transported in bulk via truck/rail or in special purpose-built tankers/ISOtainers (for solution product).

Ammonium nitrate is sold and distributed to markets in several forms including:

- bulk solids to the mining sector. Some is transported as solution in dedicated road tankers for use in special purpose mining applications; and
- as a component of a range of liquid fertilisers formulated with urea (including *Flexi-N*), currently sold at a level of over 100,000 tpa in WA.

4.4 Hours of Operation and Workforce

The facility will operate 24 hour/day, 365 days per year except for maintenance shutdowns. This does not represent a change from the existing operation hours for the current facility.

CSBP expect that an expected additional 20 people (directly and indirectly) will be required to cover production, maintenance, despatch, sales and distribution of ammonium nitrate from the expanded facility.

4.5 Construction Workforce

The expansion will result in the employment of approximately 150 people during the construction phase.
5. ENVIRONMENTAL SETTING

This section provides a description of the environmental setting relating to the proposal. Only those physical, ecological and social systems that have the potential to be affected in either a positive or negative manner by the proposal have been described in this section.

5.1 Land Use and Zoning

The entire CSBP Kwinana industrial complex encompasses an area of 138 hectares and is located within the KIA.

The land on which the Ammonium Nitrate Production Facility is sited is zoned ‘Industrial’ under the Town of Kwinana Town Planning Scheme No. 2 and the Metropolitan Regional Scheme, and is surrounded by ‘Industrial’ zoned land to the north, south and east, with Cockburn Sound to the west.

The land does not require rezoning before the proposal can be implemented.

The nearest major residential areas to the CSBP Kwinana industrial complex are Medina and Calista, located approximately three kilometres inland to the east. The town centre of Kwinana is screened from the industrial strip on the coastal plain by a ridge of well-vegetated dunes. Other nearby residential areas includes Orelia, Parmelia, Leda and North Rockingham.

The existing major industrial operations in the vicinity of the CSBP Kwinana industrial complex are listed below (Figure 4):

- Air Liquide (air separation plant);
- Alcoa World Alumina (alumina refinery);
- Australian Gold Reagents Pty Ltd – a CSBP joint venture (sodium cyanide manufacture) \textit{(Major Hazard Facility)};
- BP Refinery (oil refining) \textit{(Major Hazard Facility)};
- Brambles WA (sulphur import, materials export);
- BOC (industrial gas production);
- Coogee Chemicals Pty Ltd (chemical manufacture and storage) \textit{(Major Hazard Facility)};
- CBH (Grain terminal);
- CIBA Speciality Chemicals (chemical manufacture) \textit{(Major Hazard Facility)};
- Cockburn/Swan Cement (cement manufacture);
- Fremantle Port Bulk Terminal;
- HIsmelt iron manufacturing plant currently under construction (December 2004);
- Mission Energy Cogeneration Plant;
- Nufarm Coogee (chlorine manufacture) \textit{(Major Hazard Facility)};
- Nufarm Ltd. (agricultural chemicals and pesticides manufacture and packaging);
- Summit Fertilisers (fertiliser manufacture and import);
- Super-fert (fertiliser manufacture and import);
- Terminals West (bulk fuel depot);
• Tiwest Joint Venture (titanium dioxide manufacture) (*Major Hazard Facility*);  
• TYCO Water (pipe manufacturing);  
• United Farmers Cooperative (fertiliser manufacture and import);  
• Western Power (power station);  
• Wesfarmers LPG Pty Ltd (LPG extraction) (*Major Hazard Facility*);  
• Wesfarmers Kleenheat Gas (LPG) (*Major Hazard Facility*); and  
• WMC Resources (nickel refining).

The KIA established by the WA Government in the early 1950s to serve as a strategic industrial area for the Perth Metropolitan Region has subsequently developed as the State’s most significant heavy industrial area.

Consequently, the KIA has been the subject of many strategic planning studies over the years with the aim of facilitating suitable industrial development. There is a buffer zone around the KIA to accommodate risk, noise and air emissions.

The most significant regional planning document currently affecting the KIA and surrounding areas is the *Fremantle Rockingham Industrial Area Regional Strategy* (FRIARS) (WAPC, 2000). The FRIARS was prepared to provide a statutory means to safeguard the future of the KIA and provide strategic land use planning for the Fremantle-Rockingham region for the next 20 – 25 years.

The *Hope Valley Wattleup Redevelopment Act 2000*, which is being implemented as the Hope Valley Wattleup Redevelopment Project, provides the legal framework for the implementation of the major recommendations of the FRIARS. Following the introduction of the *Hope Valley Wattleup Redevelopment Act 2000*, LandCorp commenced purchasing properties in the Hope Valley and Wattleup town sites as part of its role in planning, developing and promoting the land within the project area.

### 5.2 Landscape

While the generally flat landform retains little of its original vegetation, much of the eye-level visual impact of industrial complex has been ameliorated by extensive screen planting, particularly west of the railway reserve along the former CSBP evaporation pond bunds (Kinhill Stearns, 1986).

The CSBP Kwinana industrial complex is well screened from Patterson Road and, to a lesser extent, from Kwinana Beach Road. Due to the scale of industrial surroundings and the ‘tunnel vision’ effect of Patterson Road caused by generally uninterrupted traffic flow and established verge and median screen planting, the perception of visibility of the site is minimal. The CSBP Kwinana industrial complex is visible from Kwinana Beach.

The CSBP Kwinana industrial complex is not visible from residential areas with the exception of the prilling plant tower and columns in the ammonia and nitric acid plants.
5.3 Climate

The climate of Kwinana, as for the entire Perth metropolitan area, is characterised by a Mediterranean climate with mild wet winters and hot dry summers.

A summary of the meteorological data relevant to the CSBP Kwinana industrial complex is presented in Table 6.

<table>
<thead>
<tr>
<th>Period</th>
<th>Mean daily temperature (°C)a</th>
<th>Mean relative humidity (%)a</th>
<th>Mean Rainfall a</th>
<th>Mean daily evaporation (mm)b</th>
<th>Highest recorded wind gust (km/h) a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td>Mean Rainfall (mm)</td>
<td>No. of rain days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9am</td>
<td>3pm</td>
<td>Amount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan</td>
<td>18.7</td>
<td>29</td>
<td>53</td>
<td>55</td>
<td>10.8</td>
</tr>
<tr>
<td>Feb</td>
<td>19.2</td>
<td>29.4</td>
<td>53</td>
<td>54</td>
<td>15.4</td>
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<tr>
<td>Mar</td>
<td>17.8</td>
<td>27.6</td>
<td>56</td>
<td>54</td>
<td>16.9</td>
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<tr>
<td>Apr</td>
<td>15.6</td>
<td>24.3</td>
<td>63</td>
<td>59</td>
<td>42.2</td>
</tr>
<tr>
<td>May</td>
<td>13.2</td>
<td>21.1</td>
<td>69</td>
<td>62</td>
<td>105.7</td>
</tr>
<tr>
<td>Jun</td>
<td>11.7</td>
<td>18.7</td>
<td>74</td>
<td>66</td>
<td>162.1</td>
</tr>
<tr>
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<td>10.6</td>
<td>17.6</td>
<td>74</td>
<td>66</td>
<td>158.3</td>
</tr>
<tr>
<td>Aug</td>
<td>10.5</td>
<td>17.9</td>
<td>71</td>
<td>65</td>
<td>107</td>
</tr>
<tr>
<td>Sep</td>
<td>11.3</td>
<td>19.2</td>
<td>68</td>
<td>63</td>
<td>68.4</td>
</tr>
<tr>
<td>Oct</td>
<td>12.6</td>
<td>21.3</td>
<td>61</td>
<td>60</td>
<td>41.4</td>
</tr>
<tr>
<td>Nov</td>
<td>14.9</td>
<td>24.0</td>
<td>56</td>
<td>58</td>
<td>23.8</td>
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<td>Dec</td>
<td>17</td>
<td>26.8</td>
<td>53</td>
<td>56</td>
<td>8.2</td>
</tr>
<tr>
<td>Annual</td>
<td>14.4</td>
<td>23.0</td>
<td>63</td>
<td>60</td>
<td>760.2</td>
</tr>
</tbody>
</table>

Source:
b Bureau of Meteorology Station 009194 Medina Research Centre (1983-2004).

The mean daily minimum temperature measured at Kwinana BP Refinery ranges from 10.5°C in August to 19.2°C in February. The mean daily maximum temperature ranges from 17.6°C in July to 29.4°C in February.

The month of February has the lowest mean relative humidity measured at Kwinana BP Refinery, which is 53% at 9am and 54% at 3pm. The months of June and July have the highest mean relative humidity, both of which are 74% at 9am and 66% at 3pm.

The average annual rainfall measured at Kwinana BP Refinery is 760.2mm. Eighty percent of total rainfall falls between May and September.

Mean daily evaporation measured at the Medina research station ranges from a minimum of 1.8mm in June and July, to a maximum of 8.5mm in January. The total annual evaporation is approximately 1730mm, which exceeds annual rainfall by approximately 970mm.
Winds in the Kwinana region result from both large-scale (synoptic) winds associated with low and high-pressure systems, and local thermally influenced winds. Typically, strong offshore breezes occur during the daytime followed by corresponding onshore breezes as the land cools during the evening. This sea breeze/land breeze cycle is typical of coastal environments (Sinclair Knight Merz, 2002a).

Synoptic winds in the Kwinana region are generally from the east. During spring and summer, the easterly winds are disrupted by the sea breeze from the southwest and south southwest, which is generally an afternoon weather phenomenon (Sinclair Knight Merz, 2002a).

Summer winds tend to be quite persistent, and 50% of winds have speeds of 5 to 9 m/s. Winds during winter are typically from westerly through northerly directions. Winter winds are typically more variable with occasional periods of calm and strong storm winds, and 50% of winds having speeds of 2 to 7 m/s (D.A. Lord & Associates, 2001, p12).

The annual wind roses based on data from the Hope Valley Meteorological Station (1980) is shown below (source Sinclair Knight Merz (2002a)):

Air quality is discussed in Sections 6.3, 6.4 and 6.5.

### 5.4 Vegetation and Fauna

No remnant vegetation remains in the vicinity of the CSBP Kwinana industrial complex. The predominant vegetation species in the plant area are mixed *Eucalyptus* planted by CSBP as part of the landscaping works for its Kwinana site. Small pockets of remnant vegetation are restricted to the margins of the site boundary (Kinhill Stearns, 1986).
Due to the clearing of vegetation on the site for previous developments, there are no faunal habitats for native species other than those areas that have been established as landscaped areas around the site.

### 5.5 Landforms and Soils

The site is located towards the northern end of the Becher-Rockingham beach ridge plain. It straddles the boundary between the Quindalup soil unit, which consists of beach ridges and unconsolidated calcareous sand, and the Cottesloe soil unit, which consists of shallow, yellow-brown sands and exposed limestone (Kinhill Stearns, 1986).

### 5.6 Geology and Hydrogeology

The CSBP Kwinana industrial complex is located in the Coastal Belt subdivision of the Swan Coastal Plain in the Quindalup Dunes, which is a relic foredune plain of the Holocene period (Davidson, 1995; Gozzard, 1983). The geological profile of the site is typical of the coastal deposits found in the area and consists of Safety Bay Sand (recent) unconformably overlying Tamala Limestone, and the Leederville Formation (Pinjar Member) (Davidson, 1995).

The Safety Bay Sand comprises a thick layer (up to 20m) of calcareous sand. The calcareous sand is described by Gozzard (1983) as white medium-grained, rounded quartz and shell debris, well sorted and of eolian origin.

A geotechnical investigation at the HiSmelt site indicated that the Safety Bay Sand overlies a layer of up to 2m of silty clay and clayey sand (Dames & Moore, 1990a). The clay layer is discontinuous and pinches out towards the west.

The Tamala Limestone comprises various proportions of quartz sand, fine to medium grained shell fragments and minor clayey lenses (Davidson, 1995). The Tamala Limestone comprises an upper layer of pale yellow medium to coarse grained sand that has decomposed from the deeper limestone, which in turn is pale yellow/brown variably cemented fine to coarse grained limesand with shell debris (calcarenite) (D.A. Lord & Associates, 2001).

The Leederville Formation consists predominantly of discontinuous, interbedded sandstones, siltstones and shales with individual sandstone beds (Davidson, 1995). The sandstones are weakly consolidated, grey, fine to very coarse grained, poorly sorted, subangular to subrounded and commonly silty. The siltstones and shales are dark grey to black, typically micaceous, thinly laminated with fine-grained sandstone.

The Safety Bay Sand and the Tamala Limestone Formations contain unconfined aquifers (Dames & Moore, 1990b) that are considered to form a single (superficial) aquifer system at a regional level. The superficial aquifer is located within the Jandakot Mound division. However, detailed investigations indicate that the flow...
paths within the KIA are more complex and that the aquifers can be separated on the basis of hydrostatic head and natural groundwater quality (Barnes & Whincup, 1981). The direction of groundwater flow is generally to the north west under a hydraulic gradient of approximately 1 in 2500 (Dames & Moore, 1990b).

Fresh groundwater overlies the saline marine water in the aquifer. As groundwater flowing from the Jandakot Mound approaches the coast at Cockburn Sound it is forced over the dense saline wedge and then discharges into the shallow near shore zone (D.A. Lord & Associates, 2001). This salt water/groundwater interface occurs along the coast and can in places extend almost 1km inland.

Groundwater flow through the Tamala Limestone is highly variable and ranges between 200 and 2000m/year (Davidson, 1995). Groundwater flow through the Safety Bay Sand is significantly slower at around 20m/year (D.A. Lord & Associates, 2001).

The Tamala Limestone is the most productive and widely used aquifer in the Kwinana area with permeabilities in the order of 500 to 1500m/day. The Safety Bay Sands are unconsolidated and well compacted with permeability in the order of 10 to 20m/day (Barnes & Whincup, 1981).

The Superficial Aquifer is underlain by two major confined aquifers:

- the Leederville Formation; and
- the deeper Yarragadee Formation.

The Leederville Formation aquifer consists of interbedded sandstone, siltstone and shale units. The sand beds are frequently silty and groundwater quality is generally brackish, although local areas of fresh water do occur. Groundwater enters the Leederville Formation from downward leakage through the superficial formations on the edge of the Jandakot groundwater mound and moves westward to discharge at sea (Sinclair Knight Merz, 2002a).

The Yarragadee Formation is separated from the Leederville Formation aquifer by the South Perth Shale, a confining layer, and is a multi-layered aquifer consisting of interbedded sandstone, siltstone and shale. The aquifer contains a large resource of brackish water (Sinclair Knight Merz, 2002a).

### 5.7 Surface Hydrology and Wetlands

CSBP has constructed a pilot wetland on land leased from the BP Refinery (see Figure 2). The wetland covers approximately 1 hectare (10,000 m²), varies in depth between one and two metres and is lined with heavy-duty black plastic. The wetland is planted with sedges and incorporates a number of processes aimed at reducing the level of nitrogen in the CSBP effluent stream.
The performance of the wetland will be evaluated after two years of operation, to
determine the success of the project, and CSBP will then decide whether to proceed
with up to four cells, covering more than six hectares.

5.8 Marine Environment

The CSBP Kwinana industrial complex is located immediately adjacent to Cockburn
Sound. Cockburn Sound is 16km long and 9km wide, with a 17m to 22m deep central
basin (D.A. Lord & Associates, 2001, p1). Garden Island extends along almost the
entire western side of the Sound, providing shelter from ocean swells. Shallow waters
are located at the southern and northern entrances to the Sound. The depth of
Cockburn Sound and its degree of shelter from ocean swell make it is also the most
intensively used marine embayment in Western Australia.

In response to increasing pressures on the Sound, the Western Australian Government
established the Cockburn Sound Management Council (CSMC) in August 2000 to
coordinate environmental planning and management of Cockburn Sound and its
catchment. At the same time as the CSMC was formed, the EPA commenced drafting
the Revised Draft Environmental Protection (Cockburn Sound) Policy 2002. The
Policy outlines the environmental values, objectives and criteria for managing
Cockburn Sound, and requires the preparation of an Environmental Management Plan
by the Cockburn Sound Management Council. The Minister for the Environment
approved an interim Environmental Management Plan for Cockburn Sound and its
Catchment in December 2002.

In January 2005, the Western Australian Government released the State
Environmental (Cockburn Sound) Policy 2005 (a revision of the Revised Draft
Environmental Protection (Cockburn Sound) Policy 2002) and associated documents
including:

- Environmental Quality Criteria Reference Document For Cockburn Sound (2003 -
  2004), (EPA, 2005a);

- Manual of Standard Operating Procedures for Environmental Monitoring against
  the Cockburn Sound Environmental Quality Criteria (2004) (EPA, 2005b); and

- Environmental Management Plan for Cockburn Sound and its Catchment
  (Cockburn Sound Management Council, 2005).

The Environmental Management Plan builds on the previous studies including the
Cockburn Sound Environmental Study (Department of Conservation and
Environment, 1979), the Southern Metropolitan Coastal Waters Study (Department of
Environmental Protection, 1996) and, a compilation of the most recent work, the State
information in the Plan is drawn directly from the State of Cockburn Sound report
Sections 5.8.1 to 5.8.3 provide a brief overview of the environmental setting of Cockburn Sound, as described in the Southern Metropolitan Coastal Water Study (SMCWS) (DEP, 1996) and The State of Cockburn Sound: a Pressure-State-Response Report (D.A. Lord & Associates, 2001). Where relevant, Sections 5.8.1 to 5.8.3 also include more recent information obtained from the Environmental Management Plan for Cockburn Sound and its Catchment (Cockburn Sound Management Council, 2005), which is based on the national approach to water quality management outlined in the ANZECC/ARMCANZ (2001a) National Water Quality Management Strategy.

5.8.1 Water Movement

As a result of the protected nature of the Sound, the three main processes that control its hydrodynamics are:

- wind;

- horizontal pressure gradients due to wind, tides, waves, atmospheric pressure and continental shelf waves (which create differences in water pressure due to differences in water level); and

- horizontal pressure gradients due to buoyancy effect (differences in water density).

Based on the relative importance of wind and pressure gradients in determining circulation patterns and flushing, the three distinct hydrodynamic regimes have been identified in Cockburn Sound: ‘summer’, ‘autumn’ and ‘winter-spring’ (DEP, 1996).

The key characteristics of the three seasons are as follows (D.A. Lord & Associates, 2001):

- **Summer.** During summer, winds are the most important factor controlling the hydrodynamics. Circulation is wind-driven and the waters within both the Sound and adjacent waters are vertically well mixed and therefore well oxygenated due to a combination of wind mixing during the day (due to sea breezes) and surface cooling of the water column at night (cooler surface waters sink towards the seabed, enhancing vertical mixing).

- **Autumn.** During autumn the wind subsides and pressure gradients determine the circulation. The waters in the Sound are of a greater density (cooler and saltier) compared to adjacent waters due to evaporation that has occurred during the summer and rapid cooling during autumn. The gradient between the denser waters of Cockburn Sound and the lighter adjacent water controls the flushing of Cockburn Sound to the greatest extent. Stratification within the Sound becomes apparent due to movement of lighter water into the Sound, and as noted previously, extended periods of calm may result in oxygen depletion of bottom waters.

- **Winter-spring.** In this ‘season’ the circulation is primarily driven by pressure gradients, punctuated by periods of wind-driven circulation due to storm activity.
The waters within the Cockburn Sound become progressively lighter than waters further offshore due to the relative lowering of salinity. Salinity is lowered within Cockburn Sound due to freshwater inflow, particularly from rivers. The relatively rapid response of the shallow waters of Cockburn Sound to heating (compared to offshore waters) as spring progresses also contributes to the relative decrease in density. Denser water moves into the lower depths of Cockburn Sound during calm periods (wind speeds typically less than 5m/s), and stratification persists until broken down by the passage of winter low-pressure systems about every 7-10 days”.

5.8.2 Water Quality

The water quality at eight monitoring sites within Cockburn Sound has been monitored during ‘summer’ (December to March) since 1977 (D.A. Lord & Associates, 2001).

Average water temperature in Cockburn Sound varies from about 16°C in winter to 24°C in summer (±2-3°C in the shallows, depending on the time of year). Water salinity in Cockburn Sound varies slightly from that of the open ocean (which is about 35 parts per thousand (ppt)), typically reaching 36ppt in autumn and declining to about 34ppt in winter (D.A. Lord & Associates, 2001).

The waters of Cockburn Sound are generally well oxygenated, although if calm weather persists for more than a week the deep waters at the southern end of the Sound may become low in oxygen (D.A. Lord & Associates, 2001).

The following overview of historical information on water quality in Cockburn Sound has been excerpted from The State of Cockburn Sound: A Pressure-State-Response Report (D.A. Lord & Associates, 2001, pp v-vi):

“Studies in the late 1970s found that industrial discharge into Cockburn Sound had caused widespread contamination of sediments and biota, poor water quality and widespread loss of seagrass on the eastern margin of the Sound. The loss of seagrass was attributed to light starvation due, in turn, to shading caused by nutrient-stimulated growth of epiphytes (algae that grow on seagrass leaves) and phytoplankton (microscopic algae in the water). The two main sources of nutrients were pipeline discharges: the KNC/CSBP outfall, and the Water Authority’s Woodman Point wastewater treatment plant outfall.

In the early 1990s, the Southern Metropolitan Coastal Water Study (SMCWS) found that seagrass dieback had slowed considerably, but nutrient-related water quality was only slightly better than in the late 1970s. Contaminated groundwater had replaced industrial discharge as the main nitrogen input to the Sound, and came mainly from two short areas of coastline: the southern part of the Kwinana Industrial Area; and in the Jervoise Bay Northern Harbour. Industrial discharge of metals and organic contaminants (eg. pesticides and petroleum products) had decreased substantially, as had contamination of sediments and biota. The
introduction of foreign marine organisms via shipping activities (ballast discharge, hull fouling) was also raised as a concern.

Work undertaken since the early 1990s has found no further deterioration of the health of surviving seagrass meadows, and no significant losses related to water quality. Overall water quality has improved slightly since the early 1990s, apart from in the Jervoise Bay Northern Harbour. Nutrient inputs from human activities have declined from an estimated 2000 tonnes/year in 1978 to about 300 tonnes/year in 2000, about 70% of which is from groundwater. The three main areas from which nutrient-rich groundwater is coming are: the southern part of the Kwinana Industrial Area (74 tonnes/year); the Jervoise Bay Northern Harbour (66 tonnes/year); and rural areas (46 tonnes/year).

Estimated amounts of metals and oil discharged by industry have continued to decrease due to improved waste treatment practices, and are presently about one sixth to one thousandth of those discharged in 1978, depending on the contaminant in question. A 1999 sediment survey found that contaminant levels (including arsenic and mercury) were well below environmental guidelines, apart from tributyl tin (TBT) in some areas. A survey in 1999 also confirmed the presence of two acknowledged foreign marine pests in the Sound: the European fan worm Sabella cf. Spallanzanii, and the Asian date mussel Musculista senhousia. These two pests are prolific growers and can out compete native species, affecting biodiversity, but this does not seem to be occurring in Cockburn Sound.

Nutrient-related water quality remains one of the two main environmental concerns in Cockburn Sound, and there have been concerted efforts by industry to reduce nitrogen inputs from groundwater. Western Mining Corporation’s Kwinana Nickel Refinery has reduced nitrogen discharges from about 500 tonnes/year in 1990 to 8 tonnes/year; there has been a 14% improvement at the Wesfarmers CSBP site in the four years to 2000, and inputs to the Jervoise Bay Northern Harbour are expected to decrease from 66 tonnes/year to 26 tonnes/year within a year.

Nutrient-related water quality has been monitored by means of summer surveys of chlorophyll levels (an accepted measure of phytoplankton growth) since 1977. There have been large decreases in nitrogen inputs to the Sound during summer, but this has not been matched by a similar decrease in chlorophyll levels. Up to 1990, the largest nutrient input to Sound was a ‘point’ source (the KNC/CSBP outfall) that was clearly related to overall chlorophyll levels in the Sound. Now chlorophyll levels are mainly determined by sediment nutrient cycling and diffuse nutrient inputs (groundwater), and the relationship between nutrient inputs from human activities and chlorophyll levels is less direct. With the present level of understanding, it is not possible to predict to what extent further reductions in diffuse nutrient inputs from human activities will reduce overall chlorophyll levels in the Sound, and available data indicate any response is
likely to be slow. Further reductions in diffuse nutrient inputs should, however, result in localised improvements in water quality.

The other main environmental concern in Cockburn Sound is TBT contamination, and a number of management measures address this. The WA State Government has banned the use of TBT on vessels less than 25m long, and restricted its use to low-leaching paints on boats over 25m. The Royal Australian Navy has banned TBT use on ships less than 40m in length, and is replacing TBT on larger warships with a copper based paint. The Fremantle Port Authority has banned ‘in water’ hull cleaning when ships are at berth (believed to be a major contributor of TBT to sediments). Insofar as international shipping is concerned, the International Maritime Organisation has recently announced that it will ban application of TBT to ship’s hulls from January 2003. These measures are expected to produce significant decreases in TBT contamination due to shipping movements. The high levels of TBT in Cockburn Sound sediments at present appear to be more related to shipping maintenance areas than shipping movements, and forthcoming bans on the use of TBT should reduce inputs from these areas too”.

As indicated previously, the Western Australian Government released the *State Environmental (Cockburn Sound) Policy 2005* and associated documents including an *Environmental Management Plan for Cockburn Sound and its Catchment* (Cockburn Sound Management Council, 2005) in January 2005.

The *Environmental Management Plan* (Cockburn Sound Management Council, 2005, p9) indicates that the environmental quality criteria for Cockburn Sound will be compared against the current data available for the Sound, with the results of the comparison simplified and summarised in the form of ‘report cards’ to allow managers and the community to clearly see the areas where a management response is required. It should be noted that the ‘report card’ assessment is very general by nature, relating to the whole of Cockburn Sound. It provides a broad assessment of the scale of the problems and the overall management response.

Report cards for areas afforded a high level of protection (the broader area of Cockburn Sound) and a moderate level of protection (the eastern foreshore) are included as Tables 4a and 4b respectively in the *Environmental Management Plan* (Cockburn Sound Management Council, 2005).

In relation to toxicants in water (metals and metalloids, non-metallic inorganics, organics, pesticides, herbicides and fungicides, surfactants, hydrocarbons and miscellaneous/others), the following comment was made for both high and moderate level of protection areas (Cockburn Sound Management Council, 2005):

- For the range of water toxicants monitored to date (April 2003), levels are either below the guidelines or below normal laboratory detection limits. These parameters were not intended to be sampled on an annual basis.
5.8.3 Sediment Quality

Shallower areas experience more wave and current action (which causes the finer particles to become suspended and swept away) and so have sandy sediments. Deeper areas of Cockburn Sound accumulate fine organic particles (eg. dead plankton, faecal material), and so sediments tend to be fine and silty and are naturally more organically enriched than shallower areas (D.A. Lord & Associates, 2001).

The proportion of fine particles (the silt and clay fraction) influences the amount of naturally present metals: the more silt and clay, the higher the metal levels. The original source of sediment (eg. calcium carbonate from marine organisms versus material eroded from the land) also has a strong influence on natural levels of metals as calcium carbonate generally has lower levels of metals than sediments eroded from the mainland (D.A. Lord & Associates, 2001).

Sediments also contain metals and other contaminants from anthropogenic sources. It is often difficult to determine what impact the presence of contaminants from natural and man-made sources have on the marine environment, as it is dependent on a variety of factors such as the bio-availability (which is influenced by factors such as the amount of organic matter, silt and clay) of the contaminant and the sensitivity of the receptor.

The 1976-79 Cockburn Sound Environmental Study (Department of Conservation and Environment, 1979) reported widespread contamination of sediments. A subsequent study undertaken as part of the SMCWS in 1994 found that contaminant levels had decreased significantly since the late 1970s due to large reductions in wastewater discharges from industry. Metal levels found in 1994 were generally below the then DEP draft sediment quality guidelines, with the exception of arsenic and mercury in some localised areas near industries or harbours. Very high levels of TBT (a highly toxic ingredient in antifoulant paints commonly used on large commercial vessels) were also found throughout Cockburn Sound, particularly near shipping facilities. Organic contaminants (eg. pesticides, petroleum hydrocarbons, polychlorinated biphenyls (PCBs)) were present at very low levels in 1994, and were not considered cause for concern. Organic matter and nitrogen in the sediments of the deep basin at the southern end of Cockburn Sound were higher in 1978 than in 1994, presumably due to the greater phytoplankton production (D.A. Lord & Associates, 2001).

A number of SMCWS sites were re-sampled in 1999 using the same sampling techniques and analytical methods (D.A. Lord & Associates, 2001). Although low concentrations close to or below the limit of detection make it difficult to compare the results of the 1994 and 1999 studies, it was concluded that arsenic concentrations (and all other metals) in Cockburn Sound sites were well below the national ‘Interim Sediment Quality Guidelines for the protection of marine ecosystems and TBT contamination was less than indicated by 1994 results (D.A. Lord & Associates, 2001).

More recently, the report cards for areas afforded a high level of protection (the broader area of Cockburn Sound) and a moderate level of protection (the eastern foreshore) in the Environmental Management Plan (Cockburn Sound Management
Council, 2005) contained the following comments in relation to toxicants in sediments (metals and metalloids, organometallics (e.g. TBT) and organics) for each level of protection area:

- **High:** Additional sampling for TBT required. For the range of sediment toxicants monitored to date (April 2003), levels are either below the guidelines or below normal laboratory detection limits. Sampling did not occur this sample period.

- **Moderate:** TBT met the guideline in the general moderate protection area. Key areas surrounding the harbours and the Kwinana Bulk Jetty exceeded their guideline. The resample trigger was exceeded in Jervoise Bay North Harbour (map). TBT levels are increasing in the harbours and no data is available for Careening Bay (naval waters). For the range of sediment toxicants monitored, levels are generally below guidelines or below normal laboratory detection limits. Cadmium levels at the Kwinana Bulk Jetty triggered an investigation in 2003. Further testing in September 2003 did not require re-sampling but were still of concern. Current levels (April 2004) are below guidelines.

5.9 **Aboriginal and European Heritage**

A search of the Register of Aboriginal Sites held by the Department of Indigenous Affairs indicates that no previously recorded Aboriginal sites are listed as being located within or overlapping the CSBP Kwinana industrial complex.

Sinclair Knight Merz (2002a) reported that McDonald, Hales and Associates undertook a heritage survey of the KIA in 1993 did not discover any archaeological sites. The ethnographic survey involved five Aboriginal consultants and a number of meetings with a local Aboriginal community organization and identified two ethnographic sites, a campsite and a mythological site (a spring), in the vicinity of James Point in the undeveloped coastal fringe of the 1993 study area. The CSBP Kwinana industrial complex directly affects neither of these sites.

A search of the Register of Heritage Places maintained by the Heritage Council of WA and the Register of the National Estate maintained by the Heritage Commission of Australia did not identify any sites of interest within the vicinity of the CSBP Kwinana industrial complex.

5.10 **Social Environment**

The nearest major residential areas to the CSBP Kwinana industrial complex are Medina and Calista, located approximately three kilometres to the east (Figure 4). The business and commercial areas of the Kwinana town centre are screened from the industrial strip on the coastal plain by a ridge of well-vegetated dunes. Other nearby residential areas includes Orelia, Parmelia, Leda and North Rockingham.

As noted previously, the CSBP Kwinana industrial complex is located within the KIA which was established by the WA Government to serve as a strategic industrial area.
for the Perth Metropolitan Region. Consequently, the KIA has been the subject of many strategic planning studies over the years with the aim of facilitating suitable industrial development. A buffer zone has been established around the KIA to accommodate risk, noise and air emissions (Figure 5).

CSBP is a full member of the Kwinana Industries Council (KIC). The KIC was founded in 1991 to:

- promote a positive image of Kwinana industries;
- work towards the long-term viability of Kwinana industry;
- coordinate a range of intra-industry activities including water quality, air quality, monitoring and emergency management;
- highlight the contribution Kwinana industry makes to community; and
- liaise effectively with local communities, government and government agencies.

In 2002, the KIC and Chamber of Commerce and Industry of WA investigated the potential economic and social benefits of the KIA as reported in *Kwinana Industrial Area Economic Impact Study – an Example of Industry Interaction* (Sinclair Knight Merz, 2002b). The study showed that the Kwinana industries contribute a wide range of economic and social benefits to the local community, WA and Australia. Kwinana industries provide direct and indirect employment, services and social initiatives and support for local community issues, with 70% of employees of the KIA living locally.

The major industry members of the KIC initiated the Kwinana Industries Education Partnership (KIEP) in 1993, which was officially launched in 1995. The KIEP is a formal agreement between members of the KIC and local senior high schools to work together to develop mutually beneficial long-term relationships in order to achieve excellence in education that broadens the learning experiences of students. The KIEP program has increased upper school retention rates from 68% to 82% since 1995, and the industry actively supports more than 800 apprenticeships and traineeships.

KIC also actively supports community consultation programs, such as the Communities and Industries Forum.

In addition, CSBP is a sponsor of the:

- Curtin University’s Centre of Excellence in Cleaner Production;
- Australian Nuffield Farming Scholars Association;
- University of Western Australia (Albany Campus) Sustainability Fund; and
- Numerous community-based programs around the KIA.
6. ENVIRONMENTAL ASSESSMENT AND MANAGEMENT

6.1 Summary of Relevant Environmental Factors

The environmental factors related to the operation of the proposed expansion of the Ammonium Nitrate Production Facility are considered to be as follows:

**Biophysical Environment**

- surface water quality (liquid effluent discharge to Cockburn Sound and possible nutrient impact due to ammonium nitrate emissions on Cockburn Sound); and
- water resources.

**Emissions Management**

- air quality – emissions of oxides of nitrogen (NO\textsubscript{x});
- air quality – emissions of ammonium nitrate particulate;
- air quality – emissions of ammonia;
- greenhouse gases – primarily emissions of nitrous oxide (N\textsubscript{2}O);
- noise; and
- solid waste disposal.

**Social Surroundings**

- public risk;
- traffic and shipping; and
- visual amenity and light overspill.

No direct impact to the biophysical environment encompassing flora, vegetation and fauna communities is envisaged given that the proposed expansion will be located entirely within the existing CSBP industrial complex boundary.

A detailed discussion about the existing environment, assessment of the impact, predicted environmental outcomes and management commitments for each environmental factor is provided in Sections 6.3 to 6.13. In all cases consideration has been given to the principles contained in the EPA Position Statement No. 7 Principles of Environmental Protection (EPA, 2004b).

A summary of the potential environmental impacts, management strategies and predicted outcomes is provided in Table 29.

Most of the “Environmental Objectives” provided in Table 29 and Sections 6.3 to 6.13, have been derived from the Environmental Protection Authority Guide to EIA Environmental Factors and Objectives (EPA, 2002a). Where objectives for environmental factors have not been published by the EPA, CSBP has presented its own objective to ensure the relevant environmental factor is adequately addressed, and an acceptable environmental outcome is achieved.
6.2 Construction Environmental Impacts

6.2.1 General

As CSBP already has an EMS in place, which is consistent with the international standard ISO 14001, to assist in the management of environmental compliance and also has a comprehensive set of environmental management procedures, CSBP considers that most of the environmental issues with respect to the construction of the expanded facility will be routinely addressed. Nevertheless, CSBP recognises that there may be some environmental issues that are specific to the construction phase of the expansion that are not currently addressed by the existing EMS and related procedures.

Therefore, CSBP will prepare a Construction Environmental Management Plan (CEMP) for the construction phase of the expansion. This CEMP will be submitted to the DoE prior to construction. The CEMP will address management of:

- construction noise;
- construction dust; and
- construction waste (CSBP will modify the existing Waste Management Plan to also address construction waste).

CSBP and contractors undertaking the construction operations will apply the CEMP within the Kwinana industrial complex at all times during the construction phase of the expansion.

6.2.2 Construction Noise

Noise generated during the construction period may be related to:

- pile driving; and
- use of construction equipment.

Construction activities will be carried out in accordance with the *Environmental Protection (Noise) Regulations 1997* and the control of noise practices set out in the Australian Standard 2436-1981 “Guide to Noise Control on Construction, Maintenance and Demolitions Sites”.

Construction activities will be undertaken between 7am and 7pm on Monday to Saturdays. If construction activities are to be undertaken outside of these hours then CSBP will comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* for “Construction out of Hours”.

CSBP will ensure that the equipment used for construction has adequate operational noise control measures fitted and all equipment is well maintained.
6.2.3 Construction Dust

During construction some dust may be generated but as construction will occur within the CSBP industrial complex dust generated during the construction activities is not expected to have a significant impact on the environment surrounding the industrial complex. However, dust will be visually monitored during construction and dust minimisation methods will be implemented if dust is identified as a problem.

6.2.4 Construction Waste

As the CSBP industrial complex has extensive infrastructures already in place, it is possible that prior to construction of the various components of the new plants some existing infrastructure may have to be removed. Soil and fill may also need to be excavated to enable new foundations to be installed.

Waste generated during the construction period may include:

- inert waste including excess fill;
- general refuse such as building rubbish and packaging material; and
- waste oils.

All construction wastes will be managed according to the modified and approved CSBP industrial complex Waste Management Plan.

6.2.5 Management Commitments

*The proponent will develop a Construction Environmental Management Plan for the construction phase of the expansion. The issues addressed in the Construction Environmental Management Plan will include but not be limited to:*

- Construction noise;
- Construction dust;
- Construction waste; and
- Transport of infrastructure.

*The Construction Environmental Management Plan will be submitted to the Department of Environment for approval prior to the commencement of construction.*

*The proponent will implement the Construction Environmental Management Plan throughout the construction period of the expansion.*
6.3 Air Quality – Oxides of Nitrogen

6.3.1 Environmental Objective

Ensure that gaseous emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).

6.3.2 Applicable Standards, Guidelines or Procedures

The EPA requires that oxides of nitrogen (NO₃) emissions from industry in WA meet the standards and goals for ambient air quality given in the National Environmental Protection Measure (NEPM) for Ambient Air Quality (NEPC, 1998). These values are presented in Table 7 below.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Maximum Concentration ppm (µg/m³) unless otherwise stated</th>
<th>Goal within 10 years Max. allowable exceedances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen dioxide</td>
<td>1 hour</td>
<td>0.12 ppm (225 µg/m³)</td>
<td>1 day a year</td>
</tr>
<tr>
<td></td>
<td>1 year</td>
<td>0.03 ppm (56 µg/m³)</td>
<td>None</td>
</tr>
<tr>
<td>Photochemical oxidants (as ozone)</td>
<td>1 hour</td>
<td>0.10 ppm (214µg/m³)</td>
<td>1 day a year</td>
</tr>
<tr>
<td></td>
<td>4 hours</td>
<td>0.08 ppm (171µg/m³)</td>
<td>1 day a year</td>
</tr>
</tbody>
</table>

Notes: Modified from Schedule 2, NEPC (1998)
ppm = parts per million
µg/m³ means microgram per cubic metre referenced to a temperature of 25 degrees Celsius and an absolute pressure of 101.325 kilopascals.

6.3.3 Existing Environment

NOₓ is an abbreviation for a family of chemical compounds, which are commonly present in the atmosphere from either natural or anthropogenic (human) sources. NOₓ is comprised of:

- nitric oxide (NO);
- dinitrogen dioxide (N₂O₂);
- dinitrogen trioxide (N₂O₃);
- nitrogen dioxide (NO₂);
- dinitrogen tetroxide (N₂O₄); and
- dinitrogen pentoxide (N₂O₅).

Of these compounds NO₂ is regulated because it is the most prevalent form of NOₓ in the atmosphere that is generated by anthropogenic (human) activities. NO₂ is not only an important air pollutant by itself but it also reacts in the atmosphere to form ozone (O₃) in the lower levels of the atmosphere or troposphere. Tropospheric ozone is the primary constituent of photochemical smog (USEPA, 1999).
In January 2004, the KIC commissioned ENVIRON to conduct a preliminary atmospheric emissions screening assessment of Kwinana industries (ENVIRON, 2004). In that study, National Pollutant Inventory (NPI) records were examined to identify those industries that emit various compounds to the atmosphere, and air dispersion modelling was undertaken to assess long-term cumulative impacts of emissions at selected community receptor locations, including at Wells Park.

The study concluded that cumulative emissions of NO\textsubscript{x} from industries in the Kwinana airshed as characterised by NO\textsubscript{2}, did not lead to exceedances of the NEPM annual average ambient air quality criterion at any of the locations. The highest predicted impacts were at Beeliar, approximately 10 km north of the CSBP industrial complex (CSBP is considered to be too distant from the Beeliar receptor location to significantly contribute to ground level concentrations, which were attributed mainly to emissions from a nearby industrial facility). The cumulative impact of emissions caused the predicted NO\textsubscript{2} ground level concentrations at this location to be approximately 20\% of the annual average NEPM criterion. Predicted ground level concentrations at other receptor sites, including Wells Park, caused by cumulative emissions from Kwinana industries were not reported in this study, but were less than the figure reported for the Beeliar site (ENVIRON, 2004).

Ambient NO\textsubscript{2} monitoring is conducted by the DoE at its Hope Valley and Rockingham ambient air quality monitoring stations. Reported results indicate that the daily peak 1-hour NO\textsubscript{2} levels did not exceed the 0.12 ppm 1-hour average NEPM ambient air quality criterion at either the Rockingham or the Hope Valley monitoring stations for 2003 (DoE, 2004). NO\textsubscript{2} monitoring results as reported by DoE (2004) for the Hope Valley and Rockingham monitoring stations are provided in Table 8.

**TABLE 8**

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Hope Valley</th>
<th>Rockingham</th>
<th>NEPM Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>0.005ppm (16.5%)</td>
<td>0.006ppm (20%)</td>
<td>0.03 ppm (56 µg/m(^3))</td>
</tr>
<tr>
<td>1 hour</td>
<td>0.039ppm (33%)</td>
<td>0.051ppm (42.5%)</td>
<td>0.12 ppm (225 µg/m(^3))</td>
</tr>
</tbody>
</table>

Notes: Values in brackets are equivalent percentage values with reference to NEPM standards.

The results obtained for these stations were similar to those obtained at other metropolitan locations such as Duncraig and Quinns Rocks (with highest daily peak 1-hour concentrations of approximately 0.05 ppm), and significantly less than those obtained at the DoE’s Queens Buildings monitoring station in Perth City (which experiences highest daily peak 1-hour concentrations approaching the NEPM criterion of 0.12 ppm). This indicates that non-industrial sources are probably more significant contributors to ambient NO\textsubscript{2} levels than industries on the Kwinana industrial strip. This conclusion is supported by the *Perth Air Quality Management Plan*, which indicates that motor vehicle exhausts are the greatest source of nitrogen dioxide emissions in WA (DEP, 2000b).
The contribution of NO\textsubscript{x} from industries within the Cockburn/Kwinana/Rockingham airshed was also reviewed in the Kwinana Gap Emissions Study (Maunsell, 2004). The relevant data from the Kwinana Gap Emissions Study report is provided in Table 9. Industries within the study area were reported to contribute, in 2001 – 2002, just over 14,000 tonnes/year of NO\textsubscript{x} to the airshed, based on data from NPI reports. Of this amount, CSBP contributes approximately 176.5 tonnes/year or 1.3% of the total NO\textsubscript{x} loading for the Kwinana airshed. It should be noted that these NO\textsubscript{x} emissions emanate from the CSBP Kwinana industrial complex including but not limited to the Ammonium Nitrate Production Facility and the only significant source of NO\textsubscript{x} from the Ammonium Nitrate Production Facility is the nitric acid plant.

**TABLE 9**

2001 – 2002 NO\textsubscript{x} EMISSIONS REPORTED BY NPI REPORTING FACILITIES IN THE COCKBURN / KWINANA / ROCKINGHAM LOCAL GOVERNMENT AREAS

<table>
<thead>
<tr>
<th>NPI reporting facilities in Gap Emissions Study</th>
<th>NO\textsubscript{x}, kg/yr</th>
<th>% of NPI-reporting facilities NO\textsubscript{x} emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Power Kwinana</td>
<td>5651094</td>
<td>40.1</td>
</tr>
<tr>
<td>Cockburn Cement-Russell Rd, Munster</td>
<td>4862000</td>
<td>34.5</td>
</tr>
<tr>
<td><strong>Alcoa - Kwinana Alumina Refinery</strong></td>
<td>1200000</td>
<td>8.5</td>
</tr>
<tr>
<td>BP Refinery</td>
<td>940138</td>
<td>6.7</td>
</tr>
<tr>
<td>*Perth Power Partnership - Kwinana Cogen plant</td>
<td>357200</td>
<td>2.5</td>
</tr>
<tr>
<td>Wesfarmers LPG</td>
<td>334635</td>
<td>2.4</td>
</tr>
<tr>
<td>*Tiwest Pigment Plant</td>
<td>184485</td>
<td>1.3</td>
</tr>
<tr>
<td>WMC Kwinana Nickel Refinery</td>
<td>176610</td>
<td>1.3</td>
</tr>
<tr>
<td>*CSBP (includes Australian Gold Reagents)</td>
<td>176432</td>
<td>1.3</td>
</tr>
<tr>
<td>*Western Power KMK Cogen plant</td>
<td>132670</td>
<td>0.9</td>
</tr>
<tr>
<td>Coogee Chemicals</td>
<td>8107</td>
<td>0.1</td>
</tr>
<tr>
<td>Nufarm Australia Pty Ltd</td>
<td>2903</td>
<td>0.0</td>
</tr>
<tr>
<td>Jandakot Wool Washing</td>
<td>2561</td>
<td>0.0</td>
</tr>
<tr>
<td>Ciba Specialty Chemicals</td>
<td>2400</td>
<td>0.0</td>
</tr>
<tr>
<td>Millennium performance Chemicals</td>
<td>980</td>
<td>0.0</td>
</tr>
<tr>
<td>CSR - Swan Postans Quarry</td>
<td>35892</td>
<td>0.3</td>
</tr>
<tr>
<td>WA Water Corp Woodman Point</td>
<td>6460</td>
<td>0.0</td>
</tr>
<tr>
<td>George Weston Foods</td>
<td>3331</td>
<td>0.0</td>
</tr>
<tr>
<td>Amcor Packaging</td>
<td>1937</td>
<td>0.0</td>
</tr>
<tr>
<td>Shoalhaven Starches</td>
<td>1700</td>
<td>0.0</td>
</tr>
<tr>
<td>PMP Print</td>
<td>1100</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>14082635</td>
<td>100.0</td>
</tr>
</tbody>
</table>


CSBP uses the ammonia-oxidation process, the most commonly used process in the world (USEPA, 1991), to produce nitric acid. The absorption tower, common to all ammonia-oxidation nitric acid production facilities, is the primary source of NO\textsubscript{x} (waste/tail gas) emissions. Besides the NO\textsubscript{x} emissions there may also be some fugitive emissions of ammonia and nitric acid vapours but it is expected that the quantities emitted will not be significant (InfoMil, 1999). The NO\textsubscript{x} emissions are continuously vented to the atmosphere through a stack on the absorption tower. The emission of NO\textsubscript{x} occurs because the absorption section of a nitric acid plant – where NO\textsubscript{x} are absorbed in water to form nitric acid – is not 100% efficient. Research has
shown that NOX emissions from nitric acid plants range from 100 to 3,500 ppmv (parts per million by volume), with an average of 200 to 500 ppmv (van den Brink et al., 2002; EFMA, 2000a). CSBP’s existing nitric acid pant, using selective catalytic reduction (SCR) typically emits at NOX at approximately 50 ppmv, which is below the accepted standards for these plants. The current CSBP Environmental Protection Licence limit for the existing nitric acid plant is 974 ppm.

6.3.4 Best Available Technology

The European Fertilizer Manufacturers’ Association (EFMA) (2000a) recommends extended absorption and SCR as best available technology (BAT). The EFMA provides BAT emission levels for a nitric acid plant as 100 ppmv (parts per million by volume) which is equivalent to 0.65kg NOX (expressed as NO2) per tonne of 100% nitric acid product, achieved either by use of SCR or extended absorption. For medium pressure plants such as that used by CSBP the normal NOX reduction technology used is SCR.

The European Environment Agency (EEA) sets a limit value for new nitric acid plants of 350 mg/Nm3 (equivalent to 170 ppmv if all NOX is present as NO2) (EEA, 2005).

The new nitric acid plant will operate at the same performance standards as the existing plant. This plant, operating since 1996, has consistently achieved NOX concentrations of 100 mg/Nm3 (50 ppmv), well below current BAT standards.

When planning the existing nitric acid plant in 1993, CSBP staff undertook a world tour inspecting operating nitric acid plants to determine what technologies were available. The objective, in terms of NOx, was to achieve a colourless stack. At this time it was accepted that the best available technology was the then recently developed SCR route, and plants were operating with this system at NOX concentrations of 200 ppm and above. From the plant inspections CSBP realised that the stack emission was still visible at 200 ppm, and hence this did not meet the objective. Following detailed technical discussions with potential nitric acid technology providers, it was determined that the new plant could be designed to achieve 50 ppm NOX and this was specified in the plant design contract. The plant continues to operate at this NOX concentration, which is still well below accepted European standards.

The basis of the SCR technology is the addition of ammonia to the process gas in the presence of a selective catalyst. The reactions are as follows:

\[
6 \text{NO}_2 + 8 \text{NH}_3 \rightarrow 7 \text{N}_2 + 12 \text{H}_2\text{O}
\]

\[
6 \text{NO} + 4 \text{NH}_3 \rightarrow 5 \text{N}_2 + 3 \text{H}_2\text{O}
\]

\[
4 \text{NO} + 4 \text{NH}_3 \rightarrow 4 \text{N}_2 + 6 \text{H}_2\text{O}
\]

The ammonia converts the NOX (both NO2 and NO) to nitrogen but there is a practical limit to this reaction and to achieve very low NOX concentrations risks having
significant free ammonia in the exit gases. This is not a desirable outcome and hence CSBP operates the plant at the 50 ppm NO\textsubscript{X} level.

6.3.5 Assessment of Impact

CSBP commissioned ENVIRON to undertake a detailed modelling study to determine the significance of the impacts from NO\textsubscript{X} emissions under normal and worst-case plant operating conditions. The complete ENVIRON modelling study is provided as Appendix 2.

The scope of this study with respect to NO\textsubscript{X} emissions is as follows:

- model the dispersion characteristics and subsequent ground level concentrations of NO\textsubscript{X} from the nitric acid plants in the existing and upgrade scenarios; and
- assess the potential contribution of NO\textsubscript{X} emissions to photochemical smog.

NO\textsubscript{X} have been assessed to be the only compounds emitted from the nitric acid plant stack with the potential to cause significant impacts. In the context of the nitric acid plant, NO\textsubscript{X} primarily refers to nitric oxide (NO) and nitrogen dioxide (NO\textsubscript{2}). NO tends to be oxidised readily in ambient air to form NO\textsubscript{2}.

Air dispersion modelling was performed to assess the impact of the nitric acid plant duplication on NO\textsubscript{2} ground level concentrations. A qualitative assessment has also been undertaken of the potential for elevated NO\textsubscript{X} levels associated with the project to contribute to photochemical smog production.

Methodology

The primary model used for this study was the Dispmad air dispersion model. Dispmad is a standard Gaussian plume model developed by the Western Australian DoE. It includes an algorithm that considers coastal fumigation effects on plume dispersion, and is therefore considered to be an appropriate model to predict dispersion characteristics of emissions on the WA coastline.

The Dispmad air dispersion model does not include algorithms that consider the influence of building wake effects on plume dispersion. However, the prilling plant and nitric acid plant stacks are relatively tall in comparison to building heights, and building wake effects are therefore not considered to be significant in this instance.

All air quality and air pollution modelling has been undertaken in accordance with the Air Quality and Air Pollution Modelling Guidance Notes (DEP, 2000a).

Meteorological Data

Meteorological data collected by the DoE in Hope Valley during the 1980 and 1996 calendar years were used as inputs for Dispmad. Hope Valley is located approximately 7 km north of the CSBP Kwinana industrial complex, and is considered to be generally representative of the meteorology of the area.
Model Setup

The Dispmod model used to predict NO\textsubscript{X} emissions from the nitric acid plant was set up with a 6 km\textsuperscript{2} grid with 250 m grid spacing, centred on the emission sources. Samples of the Dispmod configuration files are provided in Appendix 2, Attachment A to allow the DoE Air Quality Branch to audit the modelling process.

Emissions Data

Emissions data used in this study were provided to ENVIRON by CSBP, and are presented in Table 10. The NO\textsubscript{X} emission rate was based on NO\textsubscript{X} monitoring results for the period July to September 2004, during which the nitric acid plant was running at full capacity, as measured by continuous in-stack monitoring equipment installed in the existing nitric acid plant stack. The proposed new plant was assumed for this study to be a direct duplication of the existing plant.

<table>
<thead>
<tr>
<th>TABLE 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>NITRIC ACID PLANT STACK PARAMETERS AND EMISSIONS DATA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stack Exit Height (m)</th>
<th>Existing Nitric Acid Plant</th>
<th>Proposed Nitric Acid Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stack Exit Diameter (m)</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Stack Exit Temperature (K)</td>
<td>378</td>
<td>378</td>
</tr>
<tr>
<td>Air Flow at stack temperature (m\textsuperscript{3}/hr)</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Stack Exit Velocity (m/s)</td>
<td>29.2</td>
<td>29.2</td>
</tr>
<tr>
<td>NO\textsubscript{X} Emission Rate (g/s)</td>
<td>2.2</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Whilst monitoring has not been conducted to determine the ratio of NO to NO\textsubscript{2} in the emission based on advice from the plant manufacturer Grande Paroisse (GP), it has been assumed that the molar ratio of NO to NO\textsubscript{2} in the emissions is 1:1 (ref: GP process flow diagram).

Assessment Against Ambient Air Quality Criteria

Air dispersion modelling of NO\textsubscript{X} emissions has been undertaken using the Dispmod air dispersion model, for the following scenarios:

- current emissions scenario; and
- cumulative emission scenario – operation of existing and proposed plants.

Contour plots of the predicted maximum 1-hour average and annual average ground level concentrations for each of these scenarios are presented in Appendix 2, Figures 1 and 2. As would be expected with the plant duplication, predicted ground level concentrations in the upgrade scenario are approximately double those predicted for the current operating scenario from CSBP’s existing ammonium nitrate manufacture.
The highest predicted ground level concentrations at locations that are readily accessible by the public are predicted to occur at Wells Park, a public recreation area located south of the CSBP industrial complex. Predicted ground level concentrations at this location are presented in Table 11.

**TABLE 11**

<table>
<thead>
<tr>
<th>Predicted Ground Level NO₂ Concentration</th>
<th>NEPM Guideline Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Scenario</td>
<td>Upgrade Scenario</td>
</tr>
<tr>
<td>Maximum 1-hr Average</td>
<td>20</td>
</tr>
<tr>
<td>Annual Average</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Table 11 shows that whilst the upgrade is predicted to cause an increase in ground level concentrations, the contribution of the plant to maximum 1 hr average and the annual average concentrations at Wells Park are predicted to be 13% and 0.5% respectively of the respective NEPM criteria. As discussed earlier the ENVIRON (2004) study concluded that the highest predicted NO₂ impacts for the Kwinana area were at Beeliar, approximately 10 km north of the CSBP industrial complex. The cumulative impact of emissions caused the predicted NO₂ ground level concentrations at Beeliar to be approximately 20% of the NEPM criteria and concentration at Wells Park, although not reported in the study, were less than 20% of the NEPM criteria.

Based on the ENVIRON (2004) study discussed above, the predicted increase in ground level concentrations associated with the CSBP nitric acid plant duplication is not likely to be significant in a regional context.

### 6.3.6 Contribution to Photochemical Smog Production

Photochemical smog is an air pollution problem common in large cities. It is characterised by high ozone concentrations at ground level, and can be generated through the interaction of NOₓ and reactive organic compounds (ROC) in the environment. There are a number of potential sources of both NOₓ and ROC including industrial processes, vehicle exhausts and bushfires. An assessment has been made of the impact that the elevated NOₓ emissions associated with the nitric acid plant duplication may have on photochemical smog levels in the Perth airshed.

The relationship between NOₓ and ozone is equilibrium between the following reactions:

\[
\text{NO}_2 + \text{light} \rightarrow \text{NO} + \text{O} \\
\text{O} + \text{O}_2 \rightarrow \text{O}_3 \quad \{\text{Ozone Production}\}
\]

and

\[
\text{O}_3 + \text{NO} \rightarrow \text{NO}_2 + \text{O}_2 \quad \{\text{Ozone Depletion}\}
\]

From the above equations it can be seen that ozone production caused by elevated levels of NO₂ is offset by ozone depletion caused by the reaction of ozone with NO. Ozone build-up is only significant when NO is removed from the atmosphere through
other mechanisms, such as reactions with ROC. Since NOX emissions from both the current and proposed nitric acid plants are comprised of a 1:1 molar ratio of NO to NO2, they are only likely to be significant for photochemical smog production in the event of such NO depletion.

The meteorology of Perth is such that ozone formed via reactions between NOx and ROC in the morning tends to be blown out to sea by prevailing winds, and then blown back onto land in a north-easterly direction by the sea breeze. Therefore the impact of ozone formed in Kwinana may be experienced elsewhere in the general Perth metropolitan region, particularly in Perth’s south-western suburbs, which are located northeast of Kwinana.

As photochemical smog is characterised by high ozone concentrations at ground level, a review of ozone monitoring data collected by the DoE at monitoring stations at Caversham, Quinns Rocks, Rockingham, Rolling Green, South Lake and Swanbourne was undertaken. The Rockingham site is located close to the KIA, and may therefore provide information about ozone levels in the general area. The South Lake station is located inland to the north-east of the KIA, and would be expected detect ozone initially produced at Kwinana and subsequently blown inland on the sea breeze.

Monitoring trends indicate that ozone levels at Rockingham and South Lake are generally lower than at any of the other metropolitan stations (DoE, 2004), which indicates that ozone production in the Kwinana airshed is not a dominant driver of photochemical smog in Perth. The highest ozone levels are recorded at the Caversham monitoring station, which is more likely to be influenced by ozone production in the Perth central business district (CBD). Ozone concentrations at all stations in the Perth region tend to be below health standards, with exceedances observed rarely, and only for short periods.

*The Perth Photochemical Smog Study* (WP & DEP, 1996) concluded that motor vehicle emissions contributed more to NOx and ROC levels in the Perth airshed than industrial emissions, and that ozone production was greatest in areas where vehicle emissions were concentrated, such as the Perth CBD.

### 6.3.7 Environmental Outcome

The results of the air dispersion modelling in relation to NOX emissions indicate that there should be no significant impacts associated with the expansion of the Ammonium Nitrate Production Facility. Whilst the upgrade is predicted to cause an increase in ground level NOx concentrations, the contribution of the plant to maximum 1 hr average and the annual average concentrations at Wells Park are predicted to be 13% and 0.5% respectively of the respective NEPM criteria.

Ozone monitoring studies completed by the DoE suggest that industry emissions from the KIA are not a defining factor in photochemical smog production in the Perth airshed. Based on a qualitative analysis, the following factors suggest that the increased emission of NOx due to the expansion will not be significant:
1. In relative terms, the increase NO/NO$_2$ emissions are minor when compared with existing background levels in Kwinana and the greater Perth airshed.

2. NO/NO$_2$ is present at one to one (1:1) molar ratio in the tail gases from the nitric acid plant and therefore should not upset the existing equilibrium in the main photochemical smog reactions.

3. Recent studies suggest motor vehicle emissions, not industrial emissions are the principal cause of photochemical smog in Perth.

6.3.8 Management Commitments

*The Proponent will update and continue to implement the Environmental Management Procedure: Continuous NO$_X$ Monitoring on the Nitric Acid Plant Procedure.*

*The proposed nitric acid plant will include world standard technology for controlling NO$_X$ emissions to levels comparable to the existing plant.*

6.4 Air Quality – Ammonium Nitrate Particulate

6.4.1 Environmental Objective

Ensure that gaseous emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).

6.4.2 Applicable Standards, Guidelines or Procedures

Standards and goals for ambient air quality are given in the National Environmental Protection Measure (NEPM) for Ambient Air Quality (NEPC, 1998). These values are presented in Table 12.

The Kwinana region is covered by the *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy1992* (Kwinana EPP). The Kwinana EPP defines standards (concentrations of atmospheric wastes that should not desirably be exceeded) for total suspended particles (TSP). The value for TSP is also presented in Table 12.
### TABLE 12
NEPM STANDARDS AND GOALS FOR ATMOSPHERIC PARTICULATES

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Maximum Concentration</th>
<th>Goal within 10 years (max. allowable exceedances)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particles as PM$_{10}$</td>
<td>1 day</td>
<td>50 µg/m$^3$</td>
<td>Days per year</td>
</tr>
<tr>
<td>Particles as PM$_{2.5}$ (advisory reporting standard)</td>
<td>1 day</td>
<td>25 µg/m$^3$</td>
<td>To gather sufficient data nationally to facilitate a review of the Advisory Reporting Standards as part of the review of this Measure scheduled to commence in 2005.</td>
</tr>
<tr>
<td>TSP*</td>
<td>1 day</td>
<td>90 µg/m$^3$</td>
<td>None</td>
</tr>
</tbody>
</table>

Notes: Table modified from Schedule 2, NEPC 1998 * Kwinana EPP

#### 6.4.3 Existing Environment

Particulate matter (PM) or airborne particles are a broad classification of material that consists of solid particles and fine liquid droplets. A wide range of natural and human sources produces PM. Human sources include combustion processes in motor vehicles, power generating plants and solid fuel domestic heating. Natural sources include ocean spray, wind driven soil dust and smoke from bush fires.

TSP are particles of an equivalent aerodynamic diameter of less than 50 µm. TSP is generally associated with aesthetic effects rather than health effects, as they tend to settle on surfaces and cause dirt and discoloration.

Inhalable PM are grouped into the following two size categories:

- PM$_{10}$ particles with an effective aerodynamic diameter of up to 10 µm: and
- PM$_{2.5}$ particles with an effective aerodynamic diameter of up to 2.5 µm.

Inhalable PM is associated with increases in respiratory illness such as asthma, bronchitis and emphysema.

The nearest sensitive residential premises are located approximately 3 km to the east of the site in Medina and Calista.

The nearest sensitive marine environment is Cockburn Sound, which is immediately adjacent to the CSBP industrial complex western boundary.

The contribution of PM$_{10}$ particulate emissions from industries within the Cockburn/Kwinana/Rockingham areas was reviewed in the Kwinana Gap Emissions Study (Maunsell, 2004). Industries within the study area were reported to contribute approximately 1,555 tonnes/year of PM$_{10}$ to the airshed, based on data from NPI reports submitted to the DoE. Of this amount, operations at the CSBP Kwinana industrial complex contribute approximately 238 tpa (in total) or 15% of the total PM$_{10}$ loading for the airshed. Of this 238 tpa approximately 125 tpa is from the existing Ammonium Nitrate Production Facility. The 238 tpa reported by CSBP is calculated using the approved NPI formula, and includes not only point source
emissions from industrial sources, but also emissions calculated from sources such as undeveloped land.

Although there is a comprehensive ambient air quality monitoring network in the KIA, only one station (South Lake) is used to monitor ambient PM$_{10}$ concentrations and this indicates that the highest measured 24-hour average concentration is in the order of 45µg/m$^3$ which is below the NEPM ambient standard of 50µg/m$^3$.

Currently, as indicated in the Kwinana Gap Emission Study (Maunsell, 2004) there are insufficient data available for the Kwinana region to assess the potential impacts arising from the industrial particulate emissions on public health and the environment.

The primary source of particulate emissions from the existing Ammonium Nitrate Production Facility is the prilling plant (includes both the prill tower and drying train) where liquid ammonium nitrate is converted into small drops, which when cooled form a solid sphere referred to as ‘prill’.

The particulate emissions data for the existing prilling plant is provided in Table 13 below.

### Table 13

<table>
<thead>
<tr>
<th>Source</th>
<th>Particulates (g/s)</th>
<th>PM$_{10}$ (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Dryer</td>
<td>1.5</td>
<td>0.37</td>
</tr>
<tr>
<td>Dryer</td>
<td>1.17</td>
<td>0.58</td>
</tr>
<tr>
<td>Tower (x4)</td>
<td>0.50 (x4)</td>
<td>0.50 (x4)</td>
</tr>
</tbody>
</table>

#### 6.4.4 Best Available Technology

EFMA (2000b) provides BAT emissions for the prill drying train as 30mg/Nm$^3$ particulate and for the prilling tower, as 15mg/Nm$^3$ particulate. However, it should be noted that this refers to fertiliser grade prilling towers, which have a high emission of fine particulate without abatement measures. Without abatement, the particulate can be up to 200mg/Nm$^3$.

To achieve the low particulate concentration for a prilling tower under BAT it is necessary to fit very specialised aerosol filter systems. To CSBP’s knowledge such systems are not fitted to low-density (porous grade ammonium nitrate) prilling towers as the unabated emissions are at a much lower level due to the different prilling conditions.

For the total prilling plant EFMA (2000b) indicates that BAT emissions are 0.5 kg of particulate per tonne of product.

The technologies offered to CSBP for the new prilling tower do not have the specialized aerosol filter systems, but use air re-circulation through the prilling tower via a particulate scrubber, or an in line system involving multiple uses of air within
the process, and several stages with cyclone scrubbers prior to a final pass through a venturi scrubber.

With the air recirculation system a bleed of air from the tower is passed through the main plant scrubber prior to discharge to atmosphere. This can result in a large decrease in the total volume of air discharged compared with a conventional plant design. The system proposed for the CSBP plant will be designed to achieve a particulate emission of less than 50mg/Nm\(^3\) and a total mass emission of 0.23kg/tonne of product. It should be noted that this mass emission rate is less than 50\% of the European BAT standard.

At the time of PER preparation, discussions with European technology providers are ongoing. CSBP’s commitment to provide details of the selected technologies to the EPA, and make the details public, during the preparation of the resulting EPA Bulletin remains. However, CSBP is providing our environmental outcome commitments to the technology providers, and the eventual technology chosen will meet these commitments, each of which is lower than the relevant European BAT standards for a complete prilling plant process.

6.4.5 Assessment of Impact

CSBP commissioned ENVIRON to undertake a detailed modelling study to determine the significance of the impact from particulate emissions under normal and worst-case plant operating conditions. The complete ENVIRON modelling study is provided as Appendix 2.

The scope of this study is as follows:

- model the dispersion characteristics and subsequent ground level concentrations of respirable particulate (PM\(_{10}\)) from the prilling plants in the existing and upgrade scenarios; and

- predict the rate of particulate deposition, as a precursor to assessing the impacts of deposited nitrogen compounds into Cockburn Sound.

The major emissions expected from the proposed new prilling plant are ammonium nitrate particulate and ammonia.

Air dispersion modelling has been conducted to assess the impact of constructing and operating the new plant on ground level PM\(_{10}\) concentrations. Air dispersion modelling has also been conducted to predict the rate of particulate deposition into Cockburn Sound, and an estimate has been made of the total mass of particulate deposited into Cockburn Sound over a calendar year.

Methodology

The primary model used for this study was the Dispmod air dispersion model. Dispmod is a standard Guassian plume model developed by the WA DoE. It includes an algorithm that considers coastal fumigation effects on plume dispersion, and is
therefore considered to be an appropriate model to predict dispersion characteristics of emissions on the WA coastline.

The Dispmod air dispersion model does not include algorithms that consider the influence of building wake effects on plume dispersion. However, building wake effects are not relevant for stacks with a release height 1.5 times that of the heights of surrounding buildings, which is the case for both the prilling tower and nitric acid plant stacks.

The Dispmod air dispersion model is not capable of modelling deposition of particulate. This component of the study was undertaken using the Industrial Source Complex 3 (ISC3) air dispersion model. ISC3 is one of the United States Environmental Protection Agency’s (USEPA) recommended air dispersion models, and is used extensively for regulatory assessments of industrial sources. It has been used only for the particulate deposition component of the study because it does not consider coastal fumigation effects. Since this effect is expected to only be relevant to locations inland of the plant, ISC3 is expected to provide a reasonable prediction of deposition rates into Cockburn Sound.

**Meteorological Data**

Meteorological data collected by the DoE in Hope Valley during the 1980 and 1996 calendar years were used for both Dispmod and ISC3 modelling. Hope Valley is located approximately 7km north of the CSBP Kwinana industrial complex, and is considered to be generally representative of the meteorology of the area.

Note that the land-based Hope Valley data set may not be representative of meteorology over water, and this may affect the results of modelling for particulate deposition rates in Cockburn Sound. However, this is the best available real data set. The alternative method of generating a theoretical meteorological data set for the near-shore area has not been undertaken as part of this study.

**Emissions Data**

The current prilling plant contains six stacks:

- dryer stack;
- pre-dryer stack; and
- 4 x Tower stacks mounted atop the prill tower.

The proposed new prilling plant will utilise different particulate control technology than the existing prilling plant, and gases will exhaust via a single stack.

The following emissions scenarios have been considered:

1. Current operating scenario;
2. Upgrade scenario A – operation of new prill plant in isolation at full capacity; and
3. Upgrade scenario B – operation of new prill plant at reduced capacity (70% of capacity on an instantaneous basis, and about 50% on an annual basis because of seasonal peaks in demand and the like) in conjunction with the existing prill plant modified by installation of pollution control equipment to the dryer and pre-dryer stacks (the major contributors to the emissions) to reduce coarse particulate emissions. The new scrubbers will be an irrigated mesh type which are practical to install in the existing plant structure and have given good performance in other CSBP applications.

Stack parameters, emissions data and particle size distributions used in this study were provided to ENVIRON by CSBP and are presented in Tables 14, 15 and 16 respectively.

### TABLE 14
**PRILLING PLANT STACK PARAMETERS**

<table>
<thead>
<tr>
<th>Source</th>
<th>Existing Plant</th>
<th>New Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dryer</td>
<td>Pre-dryer</td>
</tr>
<tr>
<td>Stack Exit Height (m)</td>
<td>34.2</td>
<td>34.2</td>
</tr>
<tr>
<td>Stack Exit Diameter (m)</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Stack Exit Temperature (K)</td>
<td>313</td>
<td>338</td>
</tr>
<tr>
<td>Air Flow at stack temp (m³/hr)</td>
<td>60,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Stack Exit Velocity (m/s)</td>
<td>18.6</td>
<td>12.4</td>
</tr>
</tbody>
</table>

**Note:** The existing prilling tower stacks are fitted with Chinaman’s hats, and the upward velocity is therefore considered to be zero for the purposes of air dispersion modelling.

### TABLE 15
**PRILLING PLANT PARTICULATE EMISSIONS DATA (g/s)**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Source</th>
<th>NH₃</th>
<th>Particulates</th>
<th>PM₁₀</th>
<th>PM₂.₅²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Scenario</td>
<td>Pre-Dryer</td>
<td>0</td>
<td>1.5</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>Dryer</td>
<td>0</td>
<td>1.17</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>Tower (x4)</td>
<td>0</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>4.67</td>
<td>2.95</td>
<td>2.95</td>
</tr>
<tr>
<td>Upgrade Scenario A</td>
<td>New Prill Tower</td>
<td>4.17</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>Pre-Dryer</td>
<td>0</td>
<td>0.37</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>Dryer</td>
<td>0</td>
<td>0.58</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>Tower (x4)</td>
<td>0</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
</tr>
<tr>
<td></td>
<td>New Prill Tower</td>
<td>3.12</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.12</td>
<td>4.65</td>
<td>4.65</td>
<td>4.65</td>
</tr>
</tbody>
</table>

**Notes:**

1. The existing prill plant has four exhaust fans which emit to separate towers, but not all of these are operational at all times. As a worst-case scenario it has been assumed that emissions are occurring from all four stacks for short periods (i.e. 1-hour and 24-hour averaging periods) and from an average of two stacks over longer periods (i.e. 1-year averaging period).
2. No data were available for PM2.5 emissions. For the purposes of air dispersion modeling, all PM10 particulate were assumed to be PM2.5.
TABLE 16
PARTICLE SIZE DISTRIBUTION DATA

<table>
<thead>
<tr>
<th>Source</th>
<th>0-10 µ</th>
<th>10-20 µ</th>
<th>20-30 µ</th>
<th>30-40 µ</th>
<th>40-50 µ</th>
<th>&gt;50 µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Pre-dryer Stack</td>
<td>0.24</td>
<td>0.33</td>
<td>0.24</td>
<td>0.16</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Current Dryer Stack</td>
<td>0.54</td>
<td>0.32</td>
<td>0.09</td>
<td>0.04</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>All other stacks, including upgraded pre-dryer and dryer stacks</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Assessment of Respirable Particulate (PM$_{10}$)

The Dispmod air dispersion model was used to predict ground level PM$_{10}$ concentrations, assuming that PM$_{10}$ acts as a gaseous contaminant. The following scenarios were modelled:

- current operating scenario;
- upgrade Scenario A (new prill plant in isolation); and
- upgrade Scenario B (concurrent operation of existing and new prilling plants).

Contour plots of the maximum 24-hr average ground level concentrations are presented in Figure 4 of Appendix 2. These show that PM$_{10}$ ground level concentrations are predicted to marginally improve under Upgrade Scenario A, and to be marginally higher under Upgrade Scenario B, with the highest predicted offsite 24 hr average PM$_{10}$ concentrations for all scenarios ranging from 2-5µg/m$^3$. This is well below the NEPM criterion of 50µg/m$^3$.

The prilling plant expansion is therefore not predicted to lead a significant increase in PM$_{10}$ ground level concentrations.

CSBP aims to ensure that particulate emission concentrations from the new plant will not exceed 50% of those prescribed in current licence limits with maximum emission concentrations from the prilling plant of 0.05g/Nm$^3$. The current licence prescribes a particulate limit of 0.25g/Nm$^3$ for the prilling tower and pre-dryer, and 0.35g/Nm$^3$ from the dryer. It is anticipated that even with increased prill production, the new plant will decrease current emission loads through the implementation of appropriate technology for particulate control.

Assessment of Respirable Particulate (PM$_{2.5}$)

In the absence of PM$_{2.5}$ emissions data, all PM$_{10}$ particulate were assumed to be smaller than 2.5 micron for the purposes of air dispersion modelling (i.e. PM$_{10}$ = PM$_{2.5}$). This is likely to be an overestimate of PM$_{2.5}$ emissions, as it does not account for any particles present in the 2.5 – 10 micron-size fraction.

The maximum 24-hr average ground level concentration contour plots for PM$_{10}$ presented in Appendix 2, Figure 4 are also appropriate for PM$_{2.5}$. The highest predicted off-site 24-hr average concentrations (2-5µg/m$^3$ for all scenarios) is below the NEPM advisory reporting standard of 25µg/m$^3$. 

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The Dispmod air dispersion model was used to predict the annual average ground level concentrations of PM$_{2.5}$ for each of the three scenarios presented earlier in this Section. Contour plots of annual average concentrations for each scenario are presented in Appendix 2, Figure 5. These show that the highest offsite annual average ground level concentration is approximately 0.5µg/m$_3$ for all scenarios, which is well below the NEPM advisory reporting standard of 8µg/m$_3$.

### 6.4.6 Particulate Deposition over Cockburn Sound

Given that particulate emitted from the prilling plant stacks is largely composed of ammonium nitrate particles, their deposition over Cockburn Sound may be a contributing factor to the total load of nitrogen entering the Sound. Modelling using the ISC3 air dispersion model was undertaken to predict the total load of particulate entering the Sound under the following scenarios:

- current operating scenario;
- upgrade Scenario A (new prill plant in isolation); and
- upgrade Scenario B (concurrent operation of existing and new prill plants).

The particle size distribution used in modelling is presented in Table 16. Particle density (as supplied by CSBP) and scavenging co-efficient (the default recommended in the ISC3 software) were assumed to be consistent over all particle sizes, with values of 0.75g/cm$^3$ and 0.00068 s-mm/hr respectively.

Contour plots of predicted annual particulate deposition under each scenario are presented in Appendix 2, Figures 6-8. They show that the deposition rate is predicted to decrease under both upgrade scenarios.

The total mass of particulate entering Cockburn Sound under each scenario has been estimated by drawing a 3km$^2$ grid, with 500m grid spacings over each contour plot (i.e. 36 grid squares with an area of 2,500m$^2$), and assuming a constant deposition rate over each of the grid squares. The assumed deposition rate over each grid square has been applied conservatively based upon the highest deposition rates predicted to occur at any point within that square. The assumed deposition rates over each grid square are shown pictorially on Appendix 2, Figures 6-8.

The following calculation was used to estimate the total particulate load deposited over Cockburn Sound for each scenario:

$$M_T = \sum \left( \frac{D_i \times A_i}{1000} \right)$$

Where:
- $M_T$ = Total mass deposited per year into Cockburn Sound in kg/yr
- $D_i$ = Deposition rate in g/m$^2$/yr over a specific grid square
- $A_i$ = Area of that grid square in m$^2$
Using this formula, the total annual mass deposited for each scenario was estimated to be:

- Current operating scenario 6 tpa
- Upgrade Scenario A 0.75 tpa
- Upgrade Scenario B 1.8 tpa

There will be a significant degree of error associated with these estimates, due to the conservative assumptions made about the deposition rate over each grid square (which will contribute to an over-prediction of mass deposited) and the grid size being restricted to the 3km² area over which deposition rates were predicted to be highest (which will contribute to an under-prediction of mass deposited). However, since the method used for each scenario is consistent, comparison of the calculated deposition rates under each scenario should provide a reasonable indication of their relative impacts.

To put the above results into context the nitrogen contribution to Cockburn Sound from other known sources has been provided in Table 17. As mentioned above the grid size was restricted to the 3km² area over which deposition rates were predicted to be highest which will contribute to an under-prediction of mass deposited over the entire Cockburn Sound. Using crude extrapolation techniques it has been estimated that for a deposition of around 6tpa in the 3km² modelling grid, the overall contribution to Cockburn Sound would be approximately 10tpa.

### TABLE 17
**TOTAL NITROGEN CONTRIBUTION TO COCKBURN SOUND FROM VARIOUS SOURCES**

<table>
<thead>
<tr>
<th>SOURCE OF TOTAL NITROGEN</th>
<th>CURRENT (tpa)</th>
<th>POST FEB 2005 (tpa)</th>
<th>2007 – 2008 (tpa)</th>
<th>2009 (tpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSBP Air¹</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>CSBP Effluent²</td>
<td>38</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total CSBP</td>
<td>48</td>
<td>10</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Via groundwater³</td>
<td>234 ± 88</td>
<td>234 ± 88</td>
<td>234 ± 88</td>
<td>234 ± 88</td>
</tr>
<tr>
<td>Ship loading spillages⁴</td>
<td>6.07</td>
<td>6.37</td>
<td>6.69</td>
<td>7.02</td>
</tr>
</tbody>
</table>

Notes and Sources:

1. Estimated deposition of 6tpa for the current facility has been extrapolated to 10tpa to cover the entire Cockburn Sound. The 2009 has been extrapolated from 1.8tpa.
2. CSBP effluent should be redirected to SDOOL in February 2005.
3. Smith, Turner, Herne and Hick, 2003, p147 – as no indication of the likely annual increase/decrease was provided in this document it has been assumed the contribution will remain static (note some of this groundwater contribution emanates from CSBP).
4. Cockburn Sound Management Council, 2005, p45. Cockburn Sound Management Council has conservatively estimated that commercial shipping will increase by 5% a year and therefore the tonnes per year of nitrogen have been increased accordingly using the 2002 of 5.6 tpa estimate baseline.

The data in Table 17 suggests that the nutrient addition from particulate ammonium nitrate are not significant when compared to other inputs and the actions already initiated by CSBP with respect to surface water input which will result in a net...
reduction in nitrogen load from the CSBP industrial complex. Post 2009 there will be a further reduction in the loading from ammonium nitrate particulate.

6.4.7 Health Effects – Airborne Particulate Matter

CSBP commissioned Benchmark Toxicology Services to undertake a review of the health effects of ammonium nitrate particles in air. The complete Benchmark Toxicology Services report is presented as Appendix 3.

An extract of the summary and discussion section of the Benchmark Toxicology Services report is provided below.

Air dispersion modelling for current and proposed operations by CSBP in Kwinana indicates that the highest 24-hour average levels of ammonium nitrate in ambient air, expressed, as PM$_{10}$ concentrations will not exceed 2 – 5 µg/m$^3$.

These levels are at least one order of magnitude lower than the standard for PM$_{10}$ and at least five times lower than the advisory standard for PM$_{2.5}$.

There are no environmental or occupational exposure guidelines for ammonium nitrate or nitrate that could be identified from the literature. In addition, the information on the toxicity and adverse health effects on ammonium nitrate was scant. Information on nitrates in general indicate that nitrate poses an acute risk to health at relatively high concentrations because of its effects on haemoglobin following conversion to nitrite, and consequential effects on the binding, transport and release of oxygen. Neonates are particularly sensitive to the effects on the oxygen carrying capacity of haemoglobin up to about four months of age.

Based on the effects on haemoglobin, an acceptable daily intake of 3.7mg nitrate per kg per day and a drinking water guideline of 50mg of nitrate per litre have been established by the World Health Organisation. Estimates of exposure to ammonium nitrate at the established ground level concentrations suggest that the ammonium nitrate does not pose a health risk, contributing less than 0.2% to the estimated daily intakes from dietary sources.

Moreover, the results of this assessment suggest that both the PM$_{10}$ and PM$_{2.5}$ standards would be inappropriate as reference values to assess the health risks of ammonium nitrate in ambient air. The estimates acceptable lifetime air concentrations for ammonium nitrate is at least five times higher than the 24-hour ambient air quality standards for PM$_{10}$ and PM$_{2.5}$ and at least 30 times higher than the annual average standard for PM$_{2.5}$.

The PM$_{10}$ fraction consists of particles, which have a heterogenous composition, and in many cases origin. In addition, the health effects of PM$_{10}$ are predominantly related to local effects of the particulate mixture in the respiratory system that aggravates existing conditions or illnesses.

Ambient particulate matter (PM$_{10}$) has been associated with exacerbating respiratory and cardiovascular conditions in susceptible individuals. The mechanisms of toxicity
Components of PM$_{10}$ include primary combustion particles (e.g. carbon particles from traffic or industrial processes), secondary particles (soluble constituents generated by chemical reactions in the atmosphere, including ammonium nitrate), and course particles (e.g. wind blown dust). These may have a number of other pollutants associated with them, such as organics and metals that may be toxic by themselves or in combination, hence contributing to the overall toxicity of the PM$_{10}$ fraction.

The ammonia and oxides of nitrogen in the emissions might react to form ammonium nitrate in the air. In addition, the ammonia may react with the sulphur dioxide from other sources to form ammonium sulphate. The extent of the reactions will depend, *inter alia*, on the concentrations of the substrates, which in the case of emissions from the CSBP plants being considered are relatively low. Notwithstanding, the nitrate normally associated with PM$_{10}$ from secondary sources is generally considered to have low potential in itself for causing toxic effects, thus is likely to contribute minimally to the overall effects of PM$_{10}$.

Thus considering particles of essentially pure substances that have systemic effects, but lack the local effects associated with the PM$_{10}$ particles, the use of the PM$_{10}$ or PM$_{2.5}$ standard is likely to be over protective for substances of low toxicity (e.g. ammonium nitrate) and be under protective for substances of high toxicity.

### 6.4.8 Environmental Outcome

Offsite ground level concentrations of PM$_{10}$ are not predicted to change significantly and particulate deposition rates over Cockburn Sound are predicted to decrease as a result of the implementation of the proposal.

Contour plots of the maximum 24 hour average ground level concentrations are presented in Figure 4 of Appendix 2. These show that PM$_{10}$ ground level concentrations are predicted to be marginally lower under Upgrade Scenario A, and to be marginally higher under Upgrade Scenario B, with the highest predicted offsite 24 hr average PM$_{10}$ concentrations for all scenarios ranging from 2-5 µg/m$^3$. This is well below the NEPM criterion of 50 µg/m$^3$. The prill plant upgrade is therefore not predicted to lead a significant increase in PM$_{10}$ ground level concentrations. As such it is unlikely that the emission of fine particulate from the existing and proposed ammonium nitrate plants will have any significant environmental or health impacts.

Even if the total particulate emission is assumed to be PM$_{2.5}$ the proposal is still well within the (lower) interim NEPM values.

The particulate deposition on Cockburn Sound under either expansion scenario for the Ammonium Nitrate Production Facility is predicted to be lower than the deposition from the existing Facility.
6.4.9 Environmental Commitments

*CSBP will design and construct the new prilling plant to meet the emissions values specified in the Public Environmental Review.*

*If the existing prilling tower is to be operated beyond the commissioning period for the new plant (up to 12 months) then CSBP will fit appropriate scrubbing and emission control equipment to the existing prilling plant to ensure the emissions values are met.*

*Whether one prilling plant or two are being operated CSBP commits that the total emissions levels determined as meeting ambient standards report will be met.*

6.5 Air Quality – Emissions of Ammonia

6.5.1 Environmental Objective

Ensure that gaseous emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).

6.5.2 Applicable Standards, Guidelines or Procedures

The NEPC has not set ambient air quality criteria for ammonia. However, various American and European agencies have set ammonia standards, and the following have been used for the model:

- 1 hr average – 3,200µg/m³ (OEHHA, 2000)
- Annual average – 100µg/m³ (USEPA, 2004)

The Office of Environmental Health Hazard Assessment (OEHHA) and United States Environmental Protection Authority (USEPA) standards are generally considered to be conservative, and are used extensively in health hazard assessments.

6.5.3 Existing Environment

The KIC Phase 1 Screening Assessment (ENVIRON, 2004) assessed the long-term impacts of ammonia emissions from all major industries in Kwinana. The study predicted that the highest predicted ammonia ground level concentration at a community location would be at Wells Park, to the south of the CSBP site, and that the annual average concentration at this location would be approximately 50 µg/m³, half the USEPA ambient air criterion. Industry was considered to be the dominant contributor to ammonia at this location, with the CSBP contribution from all of its plants being approximately 6% of the total.
6.5.4 Assessment of Impact

CSBP commissioned ENVIRON to undertake a detailed modelling study to determine the significance of the impact from ammonia emissions under normal and worst-case plant operating conditions. The complete ENVIRON modelling study is provided as Appendix 2.

The scope of this study was to model the dispersion characteristics and subsequent ground level concentrations of ammonia (NH₃) from the prilling plants in the existing and expanded scenarios.

The major emissions expected from the proposed new prilling plant are ammonium nitrate particulate and ammonia.

Ammonia emissions data used in this study were provided to ENVIRON by CSBP and are presented in Table 18.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Source</th>
<th>Ammonia (g/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Scenario</td>
<td>Pre-Dryer</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Dryer</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tower (x4)</td>
<td>0</td>
</tr>
<tr>
<td>Upgrade Scenario A</td>
<td>New Prill Tower</td>
<td>4.17</td>
</tr>
<tr>
<td>Upgrade Scenario B</td>
<td>Pre-Dryer</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Dryer</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tower (x4)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>New Prill Tower</td>
<td>3.12</td>
</tr>
</tbody>
</table>

Regular monitoring by CSBP’s stack testing contractor of gaseous emissions from the existing prilling tower in accordance with approved methods has failed to detect significant quantities of ammonia. The manufacturer for the new prilling tower has indicated that up to 4 g/s of ammonia will be emitted. As a result, Environ has modelled the new plant using the manufacturers predicted ammonia emission rate and the tabulated emission data reflects this position.

CSBP stack testing consultants undertake USEPA Method 5 testing as required by the CSBP Environmental Protection Licence, on a regular basis and analyse the probe rinse solution, the impinger solution and determine the mass of particulate captured on the filter. The consultant’s reports indicate that the molar ratio of ammonia and nitrate nitrogen is frequently approximately 1:1 and a significant proportion of the sample is recovered as a white solid in the probe rinse. This suggests that ammonium nitrate is the dominant form of nitrogen in the emission, and that the large majority of the ammonia being measured is as ammonium nitrate particulate.

Air dispersion modelling using the Dispmod air dispersion model has been undertaken to predict ground level concentrations of ammonia resulting from emissions when the
new prilling plant is operated in isolation under full capacity (upgrade scenario A), which will be the worst-case upgrade scenario with respect to ammonia emissions.

Contour plots of the maximum 1-hour and annual average ground level concentrations for each scenario are presented in Appendix 2, Figure 3. These show that the predicted maximum ground level concentrations at locations that are readily accessible to the public are in the order of 20 µg/m³ (1 hr average) and 0.3 µg/m³ (annual average). These are well below the ambient air quality criteria of 3,200 µg/m³ and 100 µg/m³ respectively.

6.5.5 Environmental Outcome

As the annual average ground level concentration of ammonia at Wells Park from all Kwinana industries is predicted to be approximately 50 µg/m³ (half the USEPA ambient air criterion) (ENVIRON, 2004). The predicted increase of 0.3 µg/m³ (annual average) associated with the construction of the new prilling plant is therefore not considered to be significant in a regional context.

6.5.6 Management Commitments

The proponent will monitor in accord with standards and techniques required by the Environmental Protection Licence ammonia emissions from the existing and new prilling tower.

The proponent will report the results of the ammonia monitoring as required by the Environmental Protection Licence.

6.6 Greenhouse Gases

6.6.1 Environmental Objective

The EPA’s published environmental objective in relation to the assessment and management of greenhouse gases is:

“To minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions (EPA, 2002b).”

6.6.2 Applicable Standards, Guidelines or Procedures

The EPA’s position with respect to greenhouse gas issues is detailed in Guidance for the Assessment of Environmental Factors, Statement No. 12: Minimising Greenhouse Gas Emissions (2002b).

As part of the Commonwealth’s efforts to control greenhouse gas emissions the Greenhouse Challenge program has been developed. The Greenhouse Challenge Program is a key element of the National Greenhouse Response Strategy and is derived from the Greenhouse 21C program. It is a cooperative agreements program.
for industry and government to work together in meeting Australia’s obligations under the Framework Convention on Climate Change (FCCC).

CSBP has been a signatory to the Greenhouse Challenge Program since 1997 and has submitted it’s 2003/04 Challenge Report to the Australian Greenhouse Office.

The Government of Western Australian released the Western Australian Greenhouse Strategy in September 2004 (Government of Western Australia, 2004). This Greenhouse Strategy outlines the Government’s actions to reduce greenhouse gas emissions from industry and electricity generators.

Action 2.1.1 A Western Australian Greenhouse Gas Inventory will be established based on mandatory annual reporting of all six greenhouse gases by significant emitters at decreasing trigger points introduced on the following timetable:

- 2004-05 – more than 500,000 tonnes of carbon dioxide equivalent (CO2-e) year.
- 2005-06 – more than 250,000 tonnes of CO2-e year.
- 2006-07 – more than 100,000 tonnes of CO2-e year.

Emitters should not have to duplicate resources for the purpose of meeting their mandatory reporting obligations. It is envisaged the Inventory will require the same type of information that is currently provided to the Australian Greenhouse Office voluntarily, to be submitted annually. CSBP will amend its reporting structure to meet this requirement in 2004/05.

6.6.3 Existing Environment

The manufacture of ammonium nitrate at the CSBP Kwinana industrial complex contributes to the overall greenhouse inventory of the premises. Greenhouse gases are generated from the consumption of electricity and from emissions of nitrous oxide (N2O) from the nitric acid plant.

A summary of greenhouse emissions is shown in Table 19a. In 2003/04, the existing Ammonium Nitrate Production Facility produced approximately 667,394 tonnes of net CO2-e. The nitric acid plant emissions comprised approximately 97% of the total facility emissions, with the remainder associated with power consumption at the prilling plant and ammonium nitrate plant (the overall Ammonium Nitrate Production Facility actually exported electricity to the remainder of the CSBP Kwinana industrial complex to create a net saving of power generation emissions of 15,413 tonnes CO2-e).

The existing nitric acid/ammonium nitrate plants are considered ‘state of the art’ in terms of energy efficiency. The nitric acid plant is a net producer of electricity as a result of the exothermic nature of many of the chemical reactions used in the production of nitric acid.

The nitric acid plant produced approximately 119 kWhr of power per tonne of nitric acid generated in 2003/04. Taking into account power consumption for each component, the ammonium nitrate plant, prilling plant and nitric acid plant combined
result in a nett power generation of approximately 14,000 MWhr per annum. This is a nett ‘saving’ in terms of plant greenhouse gas accounting, of almost 15,500 tonnes of CO$_2$-e per annum, based on 2003/04 production rates. As a result, the Ammonium Nitrate Production Facility exports energy to other areas of the CSBP industrial complex and which offsets the greenhouse gas impact of CSBP’s business units overall.

This saving in greenhouse gas emissions is however; lower than the greenhouse impact associated with emissions of N$_2$O from the nitric acid plant. N$_2$O has a global warming potential of 310 (the multiplier used for the 100 year policy analysis (EPA 2002c)), which means that each tonne of this greenhouse gas has the equivalent greenhouse effect of 310 tonnes of CO$_2$. CSBP monitor N$_2$O emissions from the nitric acid plant on a monthly basis. In 2003/04, monthly N$_2$O emissions from the nitric acid plant ranged from 1040 ppm to 1580 ppm. Variations in N$_2$O emissions are dependant upon production rates and the condition of platinum reaction gauze catalysts used to oxidise these emissions to NO and NO$_2$ prior to discharge to atmosphere. Table 19a shows that N$_2$O emissions from the nitric acid plant for 2003/04 equate to approximately 682,086 tonnes of CO$_2$-e.

6.6.4 Assessment of Impact

Table 19c presents estimated worst case greenhouse gas emissions from the expanded Ammonium Nitrate Production Facility. The estimations are based on data weighted using the current production (Table 19a) and design capability scenario (Table 19b) to determine emissions from the expanded facility under maximum expected throughput.

The estimations assume that greenhouse abatement technologies used in the upgraded plant are the same as those used in the present facility. The estimations are also based on best-case scenarios in terms of production capabilities with the nitric acid, prilling and ammonium nitrate plants operating at peak capacity. This therefore presents worst-case scenarios for estimating greenhouse emissions.

Based on this, the overall greenhouse emissions from the expanded Ammonium Nitrate Production Facility will be over 1.5 Mtpa of CO$_2$-e (without taking into consideration the abatement and other commitments CSBP has made in this PER to reduce the greenhouse impact of this proposal). This represents an increase by approximately 132% of current (2003/04) emissions or approximately 667,394 tonnes of net CO$_2$-e. Under the expansion, the nitric acid plant contribution to facility emissions will remain at approximately 97%. Notwithstanding, the greenhouse savings from net power generation will increase by 137% from 15,412 tonnes CO$_2$-e to 36,579 tonnes CO$_2$-e. In comparison to the greenhouse inventory for the CSBP business as a whole, the contribution from the Ammonium Nitrate Production Facility will increase from 53% to 72% (assuming no change in contribution from other business units). Emissions of N$_2$O will continue to constitute the largest greenhouse emission component, contributing 74% of the total CSBP business emissions.
### TABLE 19a
**BASE CASE SCENARIO – (NITRIC ACID PLANT (NAP) – 198,561 TPA, AMMONIUM NITRATE PLANT (AN) – 248,918 TPA, PRILLING PLANT (PP) – 185,120 TPA)**

<table>
<thead>
<tr>
<th>Ammonium Nitrate Plant Facility</th>
<th>Production tpa</th>
<th>Power Consumption Generated Tonnes CO₂-e</th>
<th>Power Consumption Consumed Tonnes CO₂-e</th>
<th>Power Consumption Nett Tonnes CO₂-e</th>
<th>N₂O Sub-Total Tonnes CO₂-e</th>
<th>Total ANP Tonnes CO₂-e</th>
<th>% of total ANP Emissions</th>
<th>% of total CSBP Business Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAP</td>
<td>198,561</td>
<td>-33040</td>
<td>0</td>
<td>-33040</td>
<td>682806</td>
<td>649766</td>
<td>97.4%</td>
<td>51.1%</td>
</tr>
<tr>
<td>AN</td>
<td>248,918</td>
<td>0</td>
<td>17628</td>
<td>17628</td>
<td>0</td>
<td>17628</td>
<td>2.6%</td>
<td>1.4%</td>
</tr>
<tr>
<td>PP</td>
<td>185,120</td>
<td>0</td>
<td>17628</td>
<td>17628</td>
<td>0</td>
<td>17628</td>
<td>2.6%</td>
<td>1.4%</td>
</tr>
<tr>
<td>ANP Combined</td>
<td>632,599</td>
<td>-33040</td>
<td>17628</td>
<td>-15412</td>
<td>682806</td>
<td>667394</td>
<td>100.0%</td>
<td>52.5%</td>
</tr>
</tbody>
</table>

### TABLE 19b
**DESIGN CAPABILITY SCENARIO – (NITRIC ACID PLANT (NAP) – 200,000 TPA, AMMONIUM NITRATE PLANT (AN) – 254,000 TPA, PRILLING PLANT (PP) – 200,000 TPA)**

<table>
<thead>
<tr>
<th>Ammonium Nitrate Plant Facility</th>
<th>Production tpa</th>
<th>Power Consumption Generated Tonnes CO₂-e</th>
<th>Power Consumption Consumed Tonnes CO₂-e</th>
<th>Power Consumption Nett Tonnes CO₂-e</th>
<th>N₂O Sub-Total Tonnes CO₂-e</th>
<th>Total ANP Tonnes CO₂-e</th>
<th>% of total ANP Emissions</th>
<th>% of total CSBP Business Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAP</td>
<td>200,000</td>
<td>- 33,279</td>
<td>-</td>
<td>- 33,279</td>
<td>687,754</td>
<td>654,475</td>
<td>97.3%</td>
<td>51.3</td>
</tr>
<tr>
<td>AN</td>
<td>254,000</td>
<td>-</td>
<td>18,439</td>
<td>18,439</td>
<td>-</td>
<td>18,439</td>
<td>2.7%</td>
<td>1.4</td>
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<tr>
<td>PP</td>
<td>200,000</td>
<td>-</td>
<td>18,439</td>
<td>18,439</td>
<td>-</td>
<td>18,439</td>
<td>2.7%</td>
<td>1.4</td>
</tr>
<tr>
<td>ANP Combined</td>
<td>654,000</td>
<td>- 33,279</td>
<td>18,439</td>
<td>- 14,841</td>
<td>687,754</td>
<td>672,914</td>
<td>100.0%</td>
<td>52.7</td>
</tr>
</tbody>
</table>
TABLE 19c
WORST CASE SCENARIO – (NITRIC ACID PLANT (NAP) – 460,000TPA, AMMONIUM NITRATE PLANT (AN) – 584,000TPA, PRILLING PLANT (PP) – 600,000 TPA) FOR EXPANDED PLANT WITH NO MODIFICATIONS OR OFFSETS

<table>
<thead>
<tr>
<th>Ammonium Nitrate Plant Facility</th>
<th>Production</th>
<th>Power Consumption</th>
<th>N&lt;sub&gt;2&lt;/sub&gt;O</th>
<th>Sub-Total</th>
<th>Total ANP</th>
<th>% of total ANP Emissions</th>
<th>% of total CSBP Business Emissions</th>
<th>% increase from Design Capability Scenario</th>
<th>% increase from 2003/04 Base Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tpa</td>
<td>Generated</td>
<td>Consumed</td>
<td>Nett</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAP</td>
<td>460,000&lt;sup&gt;1&lt;/sup&gt;</td>
<td>- 76,543</td>
<td>-</td>
<td>- 76,543</td>
<td>1,581,835</td>
<td>1,505,292</td>
<td>97.4</td>
<td>70</td>
<td>130</td>
</tr>
<tr>
<td>AN</td>
<td>584,000&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td>39,964</td>
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<td>PP</td>
<td>400,000</td>
<td>-</td>
<td>39,964</td>
<td>39,964</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANP Combined</td>
<td>1,444,000</td>
<td>- 76,543</td>
<td>39,964</td>
<td>36,579</td>
<td>1,581,835</td>
<td>1,545,257</td>
<td>100.0</td>
<td>71.9</td>
<td>129.6</td>
</tr>
</tbody>
</table>

- Essentially all the nitric acid contributes to ammonium nitrate production and the majority of the ammonium nitrate is used to produce prill (ie. The total tonnage of material despatched from CSBP would be approximately 585,000 tpa under this scenario).

Notes:
Base Scenario data is sourced from CSBP Ltd AGO Progress Reporting Database (2003/04).
Extrapolations for emissions under expanded (worst Scenario) scenario are based on pro-rata production factors.
No baseline data is available for individual AN and PP power consumption.
Accordingly, the estimations for power generation emissions from the PP&AN are based on pro-rata production factors for the AN and PP combined.

Note: The tabular results presented above are based on no N<sub>2</sub>O reduction mechanisms being put in place for the proposed nitric acid plant. If the commitment to a larger boiler in the proposed plant (approximately 68,000 tpa CO<sub>2</sub>-e) and a conservative reduction of 50% in N<sub>2</sub>O generation through the fitting of N<sub>2</sub>O reduction technologies (committed when commercially feasible and available – 340,000 tpa CO<sub>2</sub>-e) are accounted for then the cumulative CO<sub>2</sub>-e emissions for the expanded facility fall to 1,137,256 tpa CO<sub>2</sub>-e from 1,581,835 tpa, before any offsets discussed in this PER are accounted for.
In the absence of technological improvements that substantially reduce N\textsubscript{2}O emissions, the expansion of the Ammonium Nitrate Production Facility will more than double the quantity of greenhouse emissions as CO\textsubscript{2}-e, in the worst-case scenario of debottlenecking the existing plants and building the new plants.

Notwithstanding the above, the existing nitric acid plant has been designed to achieve the best possible energy efficiency. In addition, the design of the facility means it is essentially best practice in terms of nitrogen oxide (NO and NO\textsubscript{2}) emissions.

The published data on N\textsubscript{2}O emissions from nitric acid plants suggests that emissions of N\textsubscript{2}O are typically in the range of 3 - 10 kg N\textsubscript{2}O/tonne of nitric acid produced (0.93 – 3.1 CO\textsubscript{2}-e/tonne of AN) produced (InfoMil, 1999). In 2003/04, CSBP’s nitric acid plant emitted N\textsubscript{2}O at the rate of 11 kg N\textsubscript{2}O/tonne of nitric acid produced although the N\textsubscript{2}O concentrations in the tailgas from CSBP’s current nitric acid plant (1040 to 1580 ppm) are in line with the range of concentrations quoted in the same reference. The plants producing the lower N\textsubscript{2}O concentrations are high dual pressure plants, which are not commercially viable when compared to the medium mono pressure plants now being constructed around the world.

### 6.6.5 Environmental Outcome

A key component in determining the focus of CSBP’s abatement initiatives has been to refine emissions monitoring and reporting methodologies in consultation with the Australian Greenhouse Office. As signatories to the Greenhouse Challenge Programme, CSBP reports annual emissions to the AGO, and has engaged an independent auditor who is certified by the Australian Greenhouse Office to audit the content of greenhouse reports, as well as the accounting systems used to generate internal greenhouse data. In addition, CSBP participated in the AGO’s program of external independent audits for the 2001/02 reporting year (the overall report is on the internet at [www.ago.gov.au](http://www.ago.gov.au) and whilst some relatively small issues were identified CSBP’s report was confirmed as providing an accurate representation).

In monitoring the greenhouse performance of each CSBP business units, activities have been broken down into two major components, specifically chemical manufacture and distribution, and fertiliser manufacture and distribution. Separate Key Performance Indicator’s (KPI’s) have been utilised to assess ongoing performance of all of the company’s manufacturing arms. Within these, KPI’s have been developed to measure performance against energy usage (GJ consumed per tonne product generated) and greenhouse gas emissions respectively (tonnes CO\textsubscript{2}-e emitted per tonne product generated).

The respective KPI’s for the individual plants comprising the Ammonium Nitrate (AN) Production Facility (including the nitric acid plant and prilling plant) are summarised in Table 19d.
TABLE 19d
GREENHOUSE GAS (GHG) SUMMARY FOR EXISTING AMMONIUM NITRATE BUSINESS IN 2003/2004

<table>
<thead>
<tr>
<th>Plant</th>
<th>Production</th>
<th>Power Consumption</th>
<th>Energy KPI</th>
<th>GHG Emissions</th>
<th>GHG KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tpa</td>
<td>GJ</td>
<td>GJ/tonne of product</td>
<td>Tonnes CO2-e</td>
<td>Tonnes CO2-e/tonne of product</td>
</tr>
<tr>
<td>NAP</td>
<td>198,561</td>
<td>-60,216</td>
<td>-0.135</td>
<td>666,252</td>
<td>1.489</td>
</tr>
<tr>
<td>AN</td>
<td>248,918</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>185,120</td>
<td>22,238</td>
<td>0.120</td>
<td>6,881</td>
<td>0.037</td>
</tr>
<tr>
<td>ANP Combined</td>
<td>632,599</td>
<td>-37,979</td>
<td>-0.060</td>
<td>673,133</td>
<td>1.064</td>
</tr>
</tbody>
</table>

Notes:
1. Energy and greenhouse gas KPI’s separated for Prill Plant and NAP/AN plant.
2. The CSBP database does not allow breakdown of power consumption or power generation for the AN and NAP separately. This is due to the way electricity invoices/receipts are collated and recorded in the database provided. Power consumption for PP is presented in CSBP database as PP/ANP, but it should be safe to assume this value represents PP consumption.

Following the expansion, it is expected that the performance of the Ammonium Nitrate Facility will be equal to or better than that described above.

As described in the footnote to Table 19c, the CO2-e emissions of the ammonium nitrate facility calculated for 584,000tpa production ammonium nitrate (the largest level foreshadowed for the future in this PER) will be reduced in terms of CO2-e per tonne of production compared to the 2003/2004 emissions as a result of the commitments CSBP has made in this document (design and construct the nitric acid plant with a larger boiler than the current plant, and retrofit N2O reduction technologies when commercially feasible, and available and proven at a conservative 50% reduction in N2O emissions). The gross CO2-e emission falls from 1,581,835tpa to 1,137,256 tpa CO2-e, and if the gross production rate is taken into account the GHG KPI would fall from the current 1.064 CO2-e per tonne of product (673,133 Tonnes CO2-e/632,599 tpa; see Table 19d) to 0.787 CO2-e per tonne of product (1,137,256 Tonnes CO2-e/1,444,000 tpa; see Table 19c and footnotes).

The regular (monthly) monitoring of N2O from the nitric acid plant by the Chemistry Centre of WA has allowed a more accurate quantification of N2O emissions from this plant. As previously discussed, N2O emissions are highly dependent upon catalyst gauze conditions, which convert N2O to NOx. CSBP is examining a range of measures at the design stage of the new nitric acid plant including the gauze system (size, shape and detailed design) and the boiler design with a view to reducing the N2O emissions. At this stage it is not possible to make any definite commitments in relation to the impact of these changes but it is confidently asserted that some reduction will be achieved and these are described in the Management Commitments (Section 6.6.6).

The major benefit that will be achieved in this area in the near future will be the use of new catalyst materials, which could result in very large reductions in N2O emissions. Pilot trials, at a commercial scale, of the new catalysts have commenced in Europe.
and it is unlikely that they will be sufficiently proven to be released prior to 2008. The preliminary indications are that $\text{N}_2\text{O}$ emissions could be reduced by more than 50% but much more testing is required before these claims could be translated to a plant operating on commercial basis. CSBP has discussed this issue with several European technology providers and at present no $\text{N}_2\text{O}$ reduction technologies for plants of the kind operated by CSBP are commercially available.

During 2004 CSBP actually trialled gauzes of a composition thought to reduce $\text{N}_2\text{O}$ generation (together with other benefits) over a 6-month period in the nitric acid plant. Unfortunately the CSBP regular monitoring did not deliver any significant changes in $\text{N}_2\text{O}$ concentrations in the tail gas when compared to the gauzes commonly fitted to the plant.

CSBP’s research (and discussions with several European technology providers) into available $\text{N}_2\text{O}$ reduction technologies for nitric acid plants has been extensive. Many of the developments currently underway are commercially sensitive, and the publicly available details are limited, however there are some detailed references available publicly, which are summarised below:

The European IPCC has published a “Draft Reference Document on Best Available Techniques in the large Volume Inorganic Chemicals, Ammonia, Acids and Fertiliser Industries (European IPCC, 2004) which includes significant publicly available detail on $\text{N}_2\text{O}$ reduction technologies that are being researched or developed currently.

Thermal decomposition is used to a limited extent, but as this technique in essence involves burning the exhaust gases of the plant in the presence of natural gas it is energy intensive, creates limited amounts of greenhouse gas through the combustion process, and is also commercially uncompetitive. CSBP’s clear preference is to await the commercial availability of catalyst based $\text{N}_2\text{O}$ reduction technologies, and has committed to the design and construct the plant to be able to use such technologies.

The European IPCC (2004) paper describes a technology which is operating on one European plant and involves a combined $\text{NO}_x$/N$_2\text{O}$ abatement reactor in the tail gas stream at temperatures above 400°C. Whilst the technology is operational, there are few details available publicly of its commercial or operational performance, presumably because of commercial in confidence matters. CSBP is aware of another technology which is under development which enables this concept to operate at slightly lower temperatures, but this technology is still at the early stages of pilot plant testing and not currently available. It may only be available to one specific nitric acid technology.

CSBP’s existing plant operates at 300°C tail gas temperatures, and can’t be upgraded at a viable cost for the above tail gas technologies. The “low temperature” tail gas technology is being offered by one potential technology provider. Grande Paroisse, the technology provider for CSBP’s existing plant, is developing an $\text{N}_2\text{O}$ reduction process which uses a granular catalyst installed beneath the main platinum gauzes, which offers the possibility of the existing plant being fitted with the technology (CSBP has committed to fitting the $\text{N}_2\text{O}$ reduction technology to the proposed plant when the technology is commercially feasible and available). Should Grande Paroisse
technology be selected for the new plant, it too will be designed to accept this N\textsubscript{2}O reduction system. The available research suggests N\textsubscript{2}O reductions of at least 70% with these technologies. Another concept under development by a number of suppliers of the platinum gauze systems is to incorporate an additional catalyst system beneath, but part of, the main gauzes. Pending European laws seem to be directed at N\textsubscript{2}O concentrations of 400 to 600 ppmv (a reduction of 55% to 70% on the levels produced by CSBP’s current plant).

CSBP is of the view that it shouldn’t be forced (as a technology purchaser) to adopt a technology that is yet to be commercially feasible or operationally proven (both in respect to N\textsubscript{2}O reduction, and also impacts on nitric acid production). CSBP has made clear commitments to design and construct the plant to suit the catalyst technologies, and to implement the technology in the new plant as it becomes available. The European IPCC (2004) paper makes it clear that European limits for N\textsubscript{2}O emission from these plants are being developed, and will be implemented (probably in the range of 400 to 600 ppm; CSBP’s current plant operates generally around 1300 to 1400ppm).

The European IPCC (2004) paper details nine potential methodologies for reducing N\textsubscript{2}O, with some limited analysis of each, but makes the point that many of the technologies have been tested either just in the laboratory, or in pilot plants and the trials are ongoing – this supports the views CSBP has gained from its discussions with technology providers.

The International Fertiliser Society (IFS) has published the proceedings of a seminar held in October 2004 (N\textsubscript{2}O Emissions Trading-Implications for the European Fertiliser Industry, Jensen, 2004) which reviews the available and under development technologies for N\textsubscript{2}O reduction in nitric acid plants. The paper concludes that N\textsubscript{2}O reduction catalysts in the boiler are preferred on performance and commercial grounds, but makes the point that the technologies are essentially under development, or insufficiently proven in operating conditions to be seen to be commercially available as yet. In light of the above comments CSBP can make the following commitments.

CSBP will closely monitor the commercial trials of new ‘low N\textsubscript{2}O emission’ catalysts for nitric acid plants and will adopt the new catalyst technology once it has been proven to be feasible in the setting of plant competing on a commercial basis. The new nitric acid plant will be designed to operate with these potential catalyst technologies.

CSBP will submit a report to the EPA three months prior to the commissioning of the new ammonium nitrate facility reviewing the current state of testing of low N\textsubscript{2}O emission catalysts. An update of this report will be submitted every two years until the new technology is adopted or the EPA advises that the report is no longer required.

Notwithstanding the above, N\textsubscript{2}O emissions from the existing and new nitric acid plants will continue to be monitored. A key initiative that will be undertaken in the
existing and proposed nitric acid plant is the installation of on-line N2O monitoring to better quantify emissions of this nature.

To date, CSBP has already implemented improvements within other site facilities such as the sodium cyanide plant. Improvements in relation to ammonia conversion efficiencies in reactors have led to greenhouse savings for the business. In addition, the optimization of the sodium cyanide plant natural gas purification plant (NGPP) in 2002/03 to remove CO2 from feed gas has led to improvements in the overall plant performance. The NGPP prevents excessive amounts of CO2 entering the feed gas stream that results in the generation of sodium carbonate by-product, reducing available sodium hydroxide for the production of sodium cyanide in the absorber.

The indirect benefit of this is a reduction in energy consumption and associated greenhouse emissions generated elsewhere in the production of sodium hydroxide.

In 2003/04, CSBP implemented a revised method for managing purchased and self-generated electricity at Kwinana. This provides greater incentives for individual plants facilities to maximize their efficiency of electricity use, and benefit from their actions, particularly in relation to off peak electricity use (which although not assessable in the generic CO2 factors for the WA power grid, does, as CSBP understands, improve operating efficiency of base load power stations).

CSBP currently maintains 85 hectare of blue gum plantations in Albany and Bunbury, which assists in greenhouse sequestration for the business. The blue gums will be thinned over the next few years, but either re-grown or replanted after logging.

CSBP intend to design the new nitric acid plant to accept the N2O reduction catalyst technologies currently under development in Europe, when they are commercially feasible and available. Additionally, if the technologies are proven and feasible commercially, CSBP will undertake the necessary work to retrofit suitable technologies to the existing nitric acid plant, once the new plant is commissioned satisfactorily, and any Australian greenhouse gas emission laws and related carbon trading schemes are resolved.

In addition, the new nitric acid plant will be designed with a larger capacity boiler (the boiler contains the catalysts and gauzes) than the current plant, and with the reduced air flow per unit area of gauze the advice from the technology providers is that this will reduce N2O generation by up to 10% (approximately 68,00 tpa of CO2-e compared to the current plant).

CSBP will retrofit a larger boiler to the existing nitric acid plant if the technology proves commercially successful in the new plant, and after any Australian greenhouse gas emission laws and related carbon trading schemes are known (CSBP does not wish to be penalised for early action in this regard and recognises the EPA’s view that the EPA can not commit beyond Western Australian laws). This same commitment applies to the retrofitting of any N2O reduction technologies in the existing plant.

The EPA’s Greenhouse Gas Guidance Statement (EPA, 2002b) requires proponents to address methods for both reducing the overall greenhouse gas emissions, or the
greenhouse gas intensity of operations. The comments above refer to the plans CSBP has to reduce greenhouse gas impact of the new plant, but in addition, CSBP is negotiating a potential offset with Alcoa World Alumina Australia.

Alcoa World Alumina Australia will be purchasing, through another party, approximately 80,000 tpa of CO₂, a by product of CSBP’s ammonia production, which will be piped to the Alcoa World Alumina Australia Kwinana residue disposal area to be injected into the residue. This process creates carbonates that not only bind CO₂ into a stable matrix, but also benefits in managing the residue disposal areas. Whilst the potential future carbon trading issues (and ownership of rights) are being resolved, CSBP is of the view that this activity can be a real offset to greenhouse gas as it is reusing CO₂ currently produced from the atmosphere.

6.6.6 Management Commitments

**CSBP will closely monitor the commercial trials of new ‘low N₂O emission’ catalysts for nitric acid plants and will adopt the new catalyst technology once it has been proven to be feasible in the setting of plant competing on a commercial basis. The new nitric acid plant will be designed to operate with these potential catalyst technologies.**

**CSBP will submit a report to the EPA three months prior to the commissioning of the new ammonium nitrate facility reviewing the current state of testing of low N₂O emission catalysts. An update of this report will be submitted every two years until the new technology is adopted or the EPA advises that the report is no longer required.**

**CSBP will design and construct the new nitric acid plant with a larger boiler than is currently in the existing nitric acid plant, which is expected reduce CO₂-e generation (from N₂O) by approximately 68,000 tpa when compared to the existing nitric acid plant.**

**CSBP will retrofit a larger boiler to the existing nitric acid plant if the technology proves commercially successful in the new plant, and after any Australian greenhouse gas emission laws and related carbon trading schemes are known (CSBP does not wish to be penalised for early action in this regard and recognises the EPA’s view that the EPA can not commit beyond Western Australian laws). This same commitment applies to the retrofitting of any N₂O reduction technologies in the existing plant.**

**Subject to the satisfactory contractual arrangement (that should be in place by June 2005) CSBP will provide up to 80,000 tpa of CO₂ to Alcoa World Alumina Australia for injection into residue disposal areas to create carbonates to bind the CO₂.**
6.7 Surface Water Quality

6.7.1 Environmental Objective

To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).

6.7.2 Applicable Standards, Guidelines or Procedures

Management of water related issues on site such that surface waters comply with the National water quality management strategy: Australian water quality guidelines for fresh and marine waters Revised Guideline No 4. (ANZECC & ARMCANZ, 2001a), Australian Guidelines for Water Quality Monitoring and Reporting (Guideline No 7) (ANZECC & ARMCANZ 2001b) and the State Environmental (Cockburn Sound) Policy 2005.

6.7.3 Existing Environment

There are no permanent natural surface water bodies within the CSBP Kwinana industrial complex. The main environmentally sensitive water body within close proximity to the industrial complex is Cockburn Sound. The CSBP industrial complex process wastewater, in the form of cooling tower blowdown and stormwater runoff, is directed to Cockburn Sound via a submarine pipeline at the average rate of 1.7 ML/day. Wastewater from plant wash down and process condensate is generally recycled within the plant or used in the superphosphate manufacturing plants. The only exception being some wash down waters from the prilling plant which cannot currently be captured in a form that is suitable for recycling and are therefore discharged into the CSBP liquid effluent system and subsequently discharged currently to Cockburn Sound after treatment and monitoring.

The main source of process water requiring offsite disposal is from ammonia plant cooling tower blow down water, which is currently generated at approximately 1 ML/day.

Daily sampling of the cooling tower water is undertaken with analysis for pH, conductivity, filtered orthophosphate, free chlorine, and temperature and flow rates.

This cooling tower blow down water, together with any wash down water that cannot be recycled is currently routinely directed to the submarine pipeline and then discharged to Cockburn Sound. Blowdown water can also be directed to the environmental ponds. Manual analysis of water quality in the blowdown water is undertaken on a weekly basis by a contracted third party. A series of online samplers continuously analyse effluent from the submerged pipeline for pH, nitrogen, and phosphorus. Where elevated levels are detected, an automated system ensures that the environmental pond pumps will trip halting discharge to Cockburn Sound.

Drainage for stormwater runoff is independent of the process water streams. Stormwater is directed to a collection sump via a series of box drains. This is then
directed to the ocean outfall only if contaminant concentrations are within acceptable trigger levels. Nitrogen, pH, and phosphorus concentrations in the stormwater are monitored using a series of online analysers strategically located at key points along the stormwater drains. When levels exceed trigger levels (nominally 30% of licence limits), drawdown pumps at the collection sump ‘cut off’ and thereby preventing further discharge of contaminants to the outfall.

Other than cooling tower blow down water, process wastewater generated from the nitric acid plant (as well as other plant facilities) is directed to dedicated collection sumps. This water is pumped to the environmental storage tanks and may be reused in the CSBP granulating plant or discharged to Cockburn Sound.

Despite the robust nature of the site surface water management system, CSBP recognises there is always a potential for accidental releases of process fluids or effluent that could lead to a discharge of contaminants. Accordingly, emergency response plan and management procedures have been developed to address a range of potential incidents such as spills, fire, transport accidents etc that could result in the release of pollutants to surface waters and Cockburn Sound. Additionally, CSBP is committed to the Kwinana Industries Mutual Aid (KIMA) agreement including various local industries within the Kwinana industrial estate, established to provide a combined industry response to emergency situations, as part of its leadership of the Kwinana Industries Public Safety group.

6.7.4 Assessment of Impact

CSBP plan to discharge process water (consisting mainly of cooling blowdown water) from the site via the Sepia Depression Ocean Outfall Landline (SDOOL). The EPA assessed the cumulative impacts of discharges to the SDOOL, which include those from CSBP, and recommendations for approval were presented to the Minister for the Environment in Bulletin 1135 (EPA, 2004c). The Minister for the Environment gave final approval to WA Water Corporation (WAWC) to dispose of industrial effluent through the SDOOL on the 28 November 2004 (this approval included CSBP’s effluent stream using the existing CSBP Environmental Protection Licence, which is itself protective of Cockburn Sound values). It is expected that CSBP disposal of industrial effluent through the SDOOL will commence in February 2005.

CSBP will design the proposed plants to initially reduce wastewater generation, and then to capture and recycle as far as possible all wastewater in the plant, or in the rest of CSBP’s site. The existence of the pilot nutrient stripping constructed wetland and CSBP’s other water recycling initiations will aid this endeavour.

6.7.5 Environmental Outcome

The nitrogen effluent emissions from the CSBP industrial complex will not exceed the existing site’s 3-month rolling average as at 30 June 2004 (which is itself historically low, and well within the ambient loads foreshadowed by the State Environmental (Cockburn Sound) Policy 2005).
6.7.6 Management Commitments

*CSBP will maintain its nitrogen emissions in effluent at a level no higher than the 3 month rolling average to June 2004 after operation of these new plants commences.*

*CSBP will maintain its commitment to dispose of effluent to the Sepia Depression when the WAWC ocean outfall pipeline is available for use (and CSBP has a contract with WAWC).*

*CSBP will review the performance of its pilot nitrogen stripping wetland by February 2006, and determine whether to proceed with the planned 3 additional wetland cells.*

*CSBP will continue, through KIC, to contribute to the State’s ambient monitoring of Cockburn Sound waters.*

6.8 Solid Waste

6.8.1 Environmental Objective

To achieve waste reduction, re-use and recycling outcomes which are environmentally, socially and economically sustainable (Waste 2020 TaskForce, 2001).

6.8.2 Existing Environment

Solid wastes produced on site as a part of the manufacturing process are held on site, assessed, and disposed of in accordance with the CSBP Waste Management Plan and procedures. Any wastes deemed as controlled wastes conform to DoE regulations for licensed disposal.

CSBP implements a waste recycling program that focuses on reducing waste to local landfill by re-cycling, re-use or reduction of waste. CSBP recycle or re-use steel, paper, oil, grease, pallets, batteries, rubber conveyor belts, drums, paper, plastics and grain waste from customers.

CSBP is an active member of the Kwinana Industries Council (KIC) Eco-efficiency Group. Through their participation in the group, CSBP is involved in reviewing the potential for synergies between industry in the areas of waste and energy to take advantage of potential improvements in efficiency and contribute to sustainability in the region.

6.8.3 Assessment and Management of Impact

The proposed expansion will result in the generation of additional wastes, during both the construction and operational phases. This is considered to be a minor impact and
the additional waste volumes will be managed under the CSBP’s modified (to include construction waste management) Waste Management Plan and procedures.

Solid waste from the existing ammonium nitrate and prilling plants is negligible and this is not expected to change with the construction of the new ammonium nitrate and prilling plants. There is however some solid waste produced by the operation of the existing nitric acid plant and the new nitric acid plant will duplicate this. An overview of the waste types that are expected to be generated by the operation of both nitric acid plants is presented in Table 20.

### TABLE 20
### WASTE TYPES

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia oxidation catalyst and catalyst getter</td>
<td>These can be recycled or reprocessed by the gauze manufacturer who recovers the precious metals to be used in new gauzes</td>
</tr>
<tr>
<td>NOX reduction catalyst</td>
<td>Spent catalysts are returned to manufacturer or disposed of at an appropriate landfill</td>
</tr>
<tr>
<td>Filter cartridges</td>
<td>As per CSBP recycling policy where possible filter cartridges are cleaned and re-used when this is not possible they are disposed of to an appropriate landfill.</td>
</tr>
<tr>
<td>Solid deposits</td>
<td>Catalyst dust will settle out in each piece of equipment. Deposits containing precious metals are recovered and sent for reprocessing to the catalyst gauze manufacturer or a precious metal refiner.</td>
</tr>
</tbody>
</table>

**6.8.4 Environmental Outcome**

Given the nature of the expansion and the activities involved, the volume of solid waste generated will be insignificant with respect to the entire CSBP Kwinana industrial complex and will be managed according to the CSBP Waste Management Plan and relevant procedures.

**6.8.5 Management Commitments**

*CSBP will update, continue to review and implement the existing CSBP Waste Management Plan and the related Solid Waste Procedure.*

**6.9 Noise**

**6.9.1 Environmental Objective**

To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards (EPA, 2002a).
6.9.2 Applicable Standards, Guidelines or Procedures

Environmental noise is governed by the *Environmental Protection (Noise) Regulations 1997*. These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor that is then added to the base levels shown in Table 21 below. The influencing factor is calculated for the usage of land within the two circles, having a radius 100m and 450m from the premises of concern.

The levels in Table 21 are conditional on no characteristics existing in the noise of concern, such as tonality, modulation or impulsiveness. If such characteristics exist then any measured level is adjusted according to Table 22.

### TABLE 21
**ASSIGNED OUTDOOR NOISE LEVEL**

<table>
<thead>
<tr>
<th>Premises Receiving Noise</th>
<th>Time of Day</th>
<th>Assigned Level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$L_{A10}$</td>
</tr>
<tr>
<td>Residential</td>
<td>0700 – 1900 hours Monday to Saturday</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>0900 – 1900 hours Sunday and Public Holidays</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>1900 – 2200 hours all days</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays</td>
<td>35</td>
</tr>
<tr>
<td>Commercial premises</td>
<td>All hours</td>
<td>60</td>
</tr>
<tr>
<td>Industrial and utility premises</td>
<td>All hours</td>
<td>65</td>
</tr>
</tbody>
</table>

### TABLE 22
**ADJUSTMENTS TO MEASURED LEVELS**

<table>
<thead>
<tr>
<th>Where tonality is present</th>
<th>Where modulation is present</th>
<th>Where impulsiveness is present</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 dB(A)</td>
<td>+5 dB(A)</td>
<td>+10 dB(A)</td>
</tr>
</tbody>
</table>

Note: These adjustments are cumulative to a maximum of 15 dB.

With respect to residential receivers, the night period is the most critical time for noise propagation. The most significant ‘assigned level’ acoustic parameter is the $L_{A10}$ noise level. At most of the residential receiver locations the influencing factor will be greater than zero, and hence the ‘assigned level’ will be greater than 35 $L_{A10}$. It is noted that the noise emissions from CSBP are not expected to be tonal in characteristic at distances exceeding 2000m, and particularly where the CSBP contribution to the noise received is at least 5 dB(A) less than measured at the location. Due to the cumulative effects of noise from a number of industries, the noise contribution from CSBP can be regarded as not significantly contributing where it is measured of predicted to be 5 dB less than the ‘assigned level’ (significantly contributing), hence noise emissions which are predicted or measured to be less than 30 $L_{A10}$ at receiver locations are likely to comply with the Regulations at all times.
At present, industrial receiver ‘assigned levels’ are 65 L\(_{A10}\), with an adjustment of +5 to the measured / predicted level if the noise is tonal in characteristic.

The DoE is in the process of a ‘Regulation Review’ (refer: Noise Regulations Review: Outcomes of the Working Group Programme, June 2000), and industrial noise ‘assigned levels’ is one area where a change is likely to occur. The most recent discussion with the DoE has revealed that a proposal to increase the Industrial Receiver ‘assigned level’ from 65 L\(_{A10}\) to 70 L\(_{A10}\) is being pursued, with the adjustments for noise characteristic not being applicable. Where an industrial premises has offices or other noise affected areas then the level would remain at 65 L\(_{A10}\), but the noise characteristic adjustments would not be applicable. A timeframe for regulation drafting and public review is not well defined but it is expected that the new regulation will be in place by the end of 2005. It is noted that should the expected Regulation review be concluded in accordance with the DoE proposal, the ‘assigned level’ at the Industrial boundary(s) adjacent CSBP Kwinana would be 70 L\(_{A10}\) (no noise characteristic adjustments required).

### 6.9.3 Existing Environment

The nearest non-industrial noise sensitive premises is located approximately 3km east of the site at Medina.

CSBP Kwinana has been active in reducing environmental noise emissions over the preceding five years. Significant noise control measures and upgrades (in approximate chronological order) have included in the following acoustic history summary.

**Prior to 2000**

- Nitric Acid Plant: Acoustic lagging of exposed compressor intercooler pipe-work and acoustic lining of compressor enclosure to reduce occupational and environmental noise emissions.

- Sodium Cyanide Plant: Attenuation of blower room ventilation fan openings. Acoustic lagging of knock-out-pot pipe-work.

**August 2000**

- Ammonia Plant 2 Start-up: Following commissioning of this plant, significant noise control was carried out on the steam de-aerator and CO\(_2\) stack to attenuate significant environmental noise emissions. The de-aerator was fitted with a larger orifice plate and discharge attenuator in November 2000. By December 2001 a 5D un-podded silencer had been inserted after the control valve to the CO\(_2\) stack, reducing environmental noise emissions significantly. The stack outlet faces in an easterly direction, and at an elevation of 60m above ground level was a significant contributor to the environmental noise emissions from the site. A reduction in sound power emissions from the site of the order of 10 dB(A) was achieved.
through these noise control measures on a new plant which was essentially undergoing rectification of commissioning defects.

**September 2000**

- Provision of acoustic data as input into the whole of Kwinana “KIC Noise Study”. Overall sound power level of 125 Lwa excluded the new Ammonia Plant (which was only under partial operation at the time).

- Sodium Cyanide Plant: Design and construction of solids plant in Sodium Cyanide area. Design reviewed for environmental noise compliance prior to construction. Relatively low noise emission plant.

**January 2002**

- Update of sound power data for the 2003 KIC review (based on ENM acoustic modelling), overall level of 123 Lwa. KIC model not re-calculated and supplied sound power levels not reflected in the reported numbers in the review report. Predicted noise level at Medina residences of 33.7 LA10 under DoE ‘Draft 8’ night conditions using ENM.

- Maintenance on Ammonium Nitrate Production Facility compressor discharge stack silencer to replace leached acoustic absorptive material. A significant source of tonal 2000 Hz noise from the 40m vertical discharge stack.

**Early 2004**

- Upgrade Ammonia Plant 2 to 745tpd (process de-bottlenecking) – negligible increase in noise emissions.

- Sodium Cyanide Plant Startup Fan (used to ventilate standby plant vessels) switched off when Plants No.1 and No.2 in concurrent operation. The start-up fan is located at the top of the SCP structure and being an elevated noise source can make a (small) contribution to the noise emissions to residential areas.

**November 2004**

- Upgrade of CSBP/AGR acoustic model for proposed Nitric Acid Plant duplication, including measurement of Nitric Acid discharge stack radiation following attenuator maintenance upgrade (12 dB(A) reduction in radiated noise emission and equivalent attenuation of discharge noise at 40m elevation). Acoustic model converted from ENM to SoundPlan to permit more detailed acoustic modelling close to plant and take advantage of better graphical outputs and reporting capabilities. Sound power of CSBP/AGR Sodium Cyanide Plant of 125.1 Lwa. Predicted noise level at Medina residences of 30.8 LA10 under adverse night wind / inversion conditions.

- Acoustic modelling of proposed Nitric Acid Plant duplication, new Prill plant and upgrade of AGR Sodium Cyanide Plant No.2 (additional compressor inside
compressor house). Commitment to provide an acoustic enclosure around existing Nitric Acid intercoolers (a significant noise emitter) for both existing and duplicate plant, with expected reduction of noise emissions from this section of plant of 10 dB(A). Predicted CSBP/AGR Sodium Cyanide Plant site sound power of 123.5 Lwa. Predicted noise level at Medina residences of 31.0 LA10 under adverse night wind / inversion conditions.

Noise emissions from the CSBP/AGR Sodium Cyanide Plant site have been systematically reduced over the past five years. The attenuation measures have been focused on the high sound power noise sources and include significant noise sources which were elevated relative to the surrounding topography and buildings. As a consequence of the high noise emissions experienced during commissioning of the new Ammonia Plant in late 2000 CSBP has placed a strong emphasis on ensuring that the engineering/acoustic design of new plant minimizes noise emissions at design. The proposed upgrades of 2005 reflect the CSBP commitment to minimizing environmental noise emissions.

In summary, noise attenuation measures implemented in various areas of the Ammonium Nitrate Production Facility to date have included installation of acoustic lagging on pipe work and intercoolers, silencers on plant boiler blowdown vents, lining of the compressor house with acoustic absorbent material to name but a few initiatives. Generally, these attenuation measures were implemented to reduce the area of high intensity noise (>100dBA) within the Facility, and achieve noise levels in occupancy areas within the CSBP industrial complex to less than 85dBA where practicable.

Following the completion of attenuation work on site in 2001, CSBP conducted a noise modelling assessment to assess the potential for residential noise impacts. The model results showed a significant reduction in the generation of noise on site and a significant reduction in noise impact on residents was observed.

**Measured Noise Levels of Existing Operations**

In the process of upgrading the acoustic model of the existing CSBP operations, boundary noise levels were measured at the BP Refinery boundary. Measured noise levels ranged from 54 – 72 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the ammonia plant located relatively close to the BP Refinery boundary (CSBP environmental sample point #3).

The existing noise emissions do not comply with the Regulation industrial receiver ‘assigned level’ of 65 L_{A10} mainly along the northern boundary of the ammonia plant. It is noted that were the Regulation ‘assigned levels’ to be changed in accordance with the recommendations of the “Noise Regulations Review: Outcomes of the Working Group Programme, June 2000”, or the proposed regulation changes as currently being proposed by DoE, then the existing noise levels at the BP Refinery boundary would be in compliance with the Regulations except for a small section next to the ammonia plant. Construction of a barrier fence (solid) could enable compliance with the existing Regulations at this location, and CSBP commits to constructing a barrier during 2005 to bring the slight exceedance at the BP boundary into conformance.
The acoustic model under ‘worst case’ daytime conditions of wind towards the BP Refinery at 4 m/s have slightly higher predicted noise levels than measured (due to the wind effect on propagation of noise).

6.9.4 Assessment of Impact

CSBP commissioned Herring Storer Acoustics to develop an acoustic model to predict noise emission from the proposed Ammonium Nitrate Production Facility expansion at the CSBP Kwinana industrial complex. The acoustic model also includes the cumulative effect of other proposed expansions within the industrial complex, namely an upgrade of the sodium cyanide solids plant and sodium cyanide plant No.2 plants by Australian Gold Reagents (AGR). The AGR facility is located on land leased from CSBP but still within the industrial complex. The complete Herring Storer noise emission study is presented in Appendix 4.

The assessment has assumed that noise emissions from the whole of CSBP operation will be tonal.

The objective of this study is to predict the noise emissions from the proposed expansion, separately and in conjunction with all other CSBP existing and proposed plant, and assess the noise level at the nearest significant premises in accordance with the Environmental Protection (Noise) Regulations 1997.

Methodology

Prediction of the noise level propagation to surrounding areas was achieved utilising the computer program SoundPlan 5.6 with parameters in accordance with the Department of Environmental Protection document “EPA Draft Guidance for Assessment of Environmental Factors No. 8 – Environmental Noise”. This program incorporates various parameters including source sound power levels, ground topography and atmospheric conditions in determining propagation of noise from the site. The CSBP Kwinana acoustic model was upgraded from a 2002 model utilising the ENM noise modelling software.

Measurements were conducted around key plant items to re-develop aspects of the model to reflect a greater interest in minimize noise levels and to incorporate the changes in noise emissions of the plant which have occurred over the last few years. Major reductions in noise emissions have occurred as a result of attenuator maintenance for the existing nitric acid stack, as well as a program of engineering controls on minor noise sources such as steam vents.

Using recognised algorithms (Concacwe) the program calculates the sound levels at distances from the source resulting in noise levels at receiver locations.

Single point calculations were carried out to rank the contribution of each source at a particular location, namely the nearest boundary of the BP Refinery, and residential locations in Medina, Calista, Leda, Hillman and North Rockingham.
The major noise sources proposed are:

- Nitric acid/ammonium nitrate plant: duplication of existing plant, incorporating existing noise control measures. The proposed expansion incorporates noise control by means of the acoustic enclosure of the existing and proposed nitric acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors.

- Prilling Plant No.2: new prilling plant incorporating process improvements. Major noise sources are fans, which will be acoustically attenuated to minimize noise emissions. Noise emissions from the new prilling plant are not expected to be significant.

The 2001 KIC noise study (SVT, 2001) and Kwinana acoustic model predicted noise levels at residential receiver locations under a range of weather conditions. A summary of the predicted and measured noise levels from the KIC report, together with the current predicted CSBP noise emissions are provided in Table 23 for comparison purposes. The significant noise reductions achieved at CSBP since the original study are reflected in the much lower predicted noise levels at the residential receiver locations.

### TABLE 23

**COMPARISON OF OPERATIONAL NOISE AT RESIDENTIAL PREMISES**

<table>
<thead>
<tr>
<th>Residential Receiver Location</th>
<th>Wind Direction / Speed Inversion Lapse Rate</th>
<th>KIC Overall Level 2001</th>
<th>KIC CSBP Contribution 2001</th>
<th>CSBP Expansion Contribution 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calista (predicted)</td>
<td>W 3 2</td>
<td>43.5</td>
<td>38.9</td>
<td>29.5</td>
</tr>
<tr>
<td>Calista (KIC measured)</td>
<td>W 2 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medina (predicted)</td>
<td>NW 3 2</td>
<td>48.0</td>
<td>38.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Medina (KIC measured)</td>
<td>NW 2 0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above figures show that has been a reduction in predicted noise level at Calista due to CSBP operations from 38.9 to 29.5 $L_{A10}$. At a level of 29.5 $L_{A10}$ the CSBP noise emissions are not technically classified as ‘significantly contributing’ and comply with the Regulation ‘assigned level’ of 35 $L_{A10}$ at Calista residences. The contributing source ranking from the KIC report (SVT, 2001) changes from 1st ranked contributor to 4th ranked contributor (assuming other industry noise emissions are unchanged).

For Medina the figures show that has been a reduction in predicted noise level due to CSBP operations from 38.0 to 31.0 $L_{A10}$. At a level of 31.0 $L_{A10}$ the CSBP noise emissions are technically classified as ‘significantly contributing’ to the Regulation ‘assigned level’ of 35 $L_{A10}$ at Medina residences. However at 31.0 $L_{A10}$ the noise contribution from CSBP would be more than 5 dB(A) less than the overall noise level (based on KIC measured / predicted levels (SVT, 2001)) and unlikely to be audible.
The contributing source ranking from the KIC report changes from 1st ranked contributor to 5th ranked contributor (assuming other industry noise emissions are unchanged).

The reductions in noise received at residential locations over recent years (since the 2001 KIC acoustic report (SVT, 2001)) are due to noise control measures implemented by CSBP. The high initial noise emission levels were due in part to a newly commissioned plant that was emitting more noise than anticipated due to contractor design issues. The proposed Ammonium Nitrate Production Facility expansion is expected to have a negligible effect on noise emissions from the CSBP industrial complex.

**Predicted Noise Levels At Residential Premises**

Predicted noise levels from the single point calculations under ‘worst case’ night-time conditions of 3 m/s wind from source to receiver with temperature inversion are summarised in Table 24.

<table>
<thead>
<tr>
<th>Location</th>
<th>Existing LA10</th>
<th>Expansion LA10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medina Residence</td>
<td>30.8</td>
<td>31.0</td>
</tr>
<tr>
<td>Calista Residence</td>
<td>29.4</td>
<td>29.5</td>
</tr>
<tr>
<td>Leda Residence</td>
<td>26</td>
<td>26.4</td>
</tr>
<tr>
<td>Hillman Residence</td>
<td>22.2</td>
<td>22.0</td>
</tr>
<tr>
<td>North Rockingham (near CBH)</td>
<td>24.9</td>
<td>25.4</td>
</tr>
<tr>
<td>East Rockingham (coast)</td>
<td>19.5</td>
<td>20.1</td>
</tr>
</tbody>
</table>

The single point calculations and the corresponding noise contour plots (see figures of the noise emission study Appendix 4) show that the noise emissions from the CSBP industrial complex are generally below 30 LA10, with a nominal 0.1 – 0.2 dB increase as a consequence of all the proposed expansions at CSBP. The exceptions are at the nearest residential location (Medina) where the predicted level is up to 31 LA10 from the CSBP operations under adverse wind conditions at night, with a temperature inversion. The predicted noise level of 31.0 LA10 at Medina is made up of the noise contributors shown in Table 25.

Based on this analysis it is concluded that the expansion of the CSBP Ammonium Nitrate Production Facility is not a significant contributor to the noise received at the Medina residential area. The proposed expansions increase the overall predicted noise emissions to Medina by 0.1 dB under the night climatic conditions of 3 m/s wind from CSBP to Medina, with temperature inversion.
TABLE 25
CONTRIBUTORS TO THE PREDICTED NOISE LEVEL AT MEDINA

<table>
<thead>
<tr>
<th>CSBP Noise Contributor</th>
<th>Noise Level Contribution at Medina</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSBP Existing Main Plant</td>
<td>25.6</td>
</tr>
<tr>
<td>CSBP Ammonium Nitrate Expansion Project</td>
<td>15.43</td>
</tr>
<tr>
<td>Sodium Cyanide Plant Existing Plant</td>
<td>29.3</td>
</tr>
<tr>
<td>Sodium Cyanide Plant Expansion Project</td>
<td>4.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>31.0</td>
</tr>
</tbody>
</table>

Predicted Noise Levels At Industrial Receivers

The significant noise source is the proposed new nitric acid plant, which is anticipated to be a duplicate of the existing nitric acid plant. The major noise source in the nitric acid plant is the compressor, and the noise radiated from ductwork to and from the intercooler heat exchangers.

There is potential to improve on the existing noise control measures incorporated in the existing nitric acid plant. The noise control measures currently incorporated into the existing nitric acid plant include:

- compressor House enclosure incorporates chequer-plate floor to control noise breakout, and acoustic lining of inner walls to reduce internal noise levels;
- acoustic lagging of compressor to intercooler ductwork;
- acoustic lagging of compressor to discharge silencer ductwork; and
- discharge silencer.

It is proposed to carry out additional noise control for the existing and proposed nitric acid plants. The additional noise control is acoustic enclosure of the existing and proposed nitric acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors.

A section of sheet metal fencing can be provided on the common boundary near the existing ammonia plant to reduce sound transmission towards BP refinery from this noise source.

The predicted noise levels from the expansion at the BP Refinery nearest boundary under ‘worst case’ daytime wind conditions are shown in Table 26.

TABLE 26
PREDICTED NOISE LEVELS FROM THE EXPANSION AT THE BP REFINERY NEAREST BOUNDARY

<table>
<thead>
<tr>
<th>Location</th>
<th>Existing, $L_{A10}$</th>
<th>Expansion, $L_{A10}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opposite Nitric Acid Plant No.2</td>
<td>62</td>
<td>69</td>
</tr>
</tbody>
</table>
The predicted noise levels with the addition of the new nitric acid plant, the new ammonium nitrate plant and the new prilling plant show an increased noise level at the BP Refinery boundary. The predicted noise level of 69 LA10 is (4 + 5 adjustment =) 9 dB in excess of the current Regulation ‘assigned level’. However, the predicted level of 69 LA10 would comply with the proposed Regulation Review ‘assigned level’ of 70 LA10 (no noise characteristic applicable). Construction of a barrier fence (solid) could enable compliance with the existing Regulations at this location, and CSBP commits to constructing a suitable barrier during 2005.

6.9.5 Environmental Outcome

Noise level propagation to the surrounding noise sensitive areas has been modelled for plant operation noise and assessed against the Environmental Protection (Noise) Regulations 1997. The sound power levels used in the predictive minimise were based on measurements of existing plant and calculation of the likely sound power increases due to the proposed plant upgrade.

Noise emissions for the proposed new nitric acid, ammonium nitrate and prilling plants comply with the Regulation requirements at the nearest residential receiver locations. The acoustic modelling shows that the predicted noise emissions from the CSBP site (existing with proposed expansions) are well within the Regulation ‘assigned level’ of 35 LA10 for residential premises under ‘worst case’ night weather conditions.

In combination with other industrial noise emitters, the noise from CSBP is not a significant contributor for all locations except Medina. At Medina, the noise from CSBP operations is predicted to be 31.0 LA10, which is ‘just’ significantly contributing to an exceedance of the assigned level of 35 LA10. The predicted CSBP noise contribution of 31 LA10 is significantly less than the KIC predicted level of 48 LA10 (due to cumulative effect of all industry) and at a level of at least 15 dB(A) less than the KIC (SVT, 2001) predicted overall noise level, would be inaudible at Medina.

The proposed expansion incorporates noise control by means of the acoustic enclosure of the existing and proposed nitric acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors.

The predicted noise levels at the nearest industrial premises (BP Refinery) currently exceeds the Regulation ‘assigned level’ of 65 LA10. The predicted noise emissions are expected to increase up at the BP Refinery boundary. Both existing and predicted noise emissions are expected to comply with the proposed Regulation Review level of 70 LA10 (no characteristic adjustment required) criteria being pursued by the DoE.

CSBP will construct a noise barrier on our northern boundary to ensure the CSBP industrial complex achieves compliance with the Environmental Protection (Noise) Regulations at this location.

CSBP will monitor the plants for compliance with the industry to industry noise limits in the Regulations, as they are currently planned to be amended. In the event the Regulations for this industry to industry noise level are not amended CSBP will
comply with the existing Regulations within 6 months of the Regulation review process ceasing (it is relevant that the small area of the BP Refinery currently potentially subject to exceedance is not a permanent workplace for any person).

6.9.6 Management Commitments

CSBP will design, construct and operate the plants to ensure that EP Act Regulation noise limits are met at residential premises to the extent CSBP’s operations contribute to the noise levels.

CSBP will monitor the plants for compliance with the industry to industry noise limits in the Regulations, as they are currently planned to be amended. In the event the Regulations for this industry to industry noise level are not amended CSBP will comply with the existing Regulations within 6 months of the Regulation review process ceasing (it is relevant that the small area of the BP Refinery currently potentially subject to exceedance is not a permanent workplace for any person)

CSBP will construct a noise barrier on its northern boundary (with the BP refinery) to eliminate the small exceedance of the Regulations in this location, during 2005.

6.10 Water Resources

6.10.1 Environmental Objective

To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected (EPA, 2002a).

6.10.2 Existing Environment

CSBP’s water resource management policy is based on the three central concepts of:

- source diversity;
- source protection; and
- appropriate water for the relevant uses

With the whole company’s water management activities based on this policy CSBP was pleased to receive the State Environment Award in 2004 for Water Management and Conservation from the Premier’s Water Foundation. Whilst appreciating the independent recognition of its activities, CSBP also recognises that its performance in managing water needs to continually improve to ensure it retains Government and community support for its activities.

Table 27 outlines the current and future (as a result of this proposal) water resource use by the various CSBP facilities at Kwinana (including the sodium cyanide business).
### TABLE 27
CURRENT AND PROPOSED WATER SOURCES AND USE AT CSBP KWINANA

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Current Use 2003/04 (kl/yr)</th>
<th>Planned Use (with this proposal) (kl/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAWC Scheme</td>
<td>101,000 (1)</td>
<td>101,000</td>
</tr>
<tr>
<td>Western Power Industrial Water Source (2)</td>
<td>378,000²</td>
<td>378,000</td>
</tr>
<tr>
<td>Kwinana Water Reclamation Plant</td>
<td>0</td>
<td>730,000⁻⁴</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1,450,000</td>
</tr>
<tr>
<td>Tamala (Shallow) Aquifer</td>
<td>1,831,421</td>
<td>1,400,000⁻⁴</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,600,000⁻⁴</td>
</tr>
<tr>
<td>Yarragadee (Artesian) Aquifer</td>
<td>2,329,921 (3)</td>
<td>1,400,000⁻⁴</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,400,000⁻⁴</td>
</tr>
<tr>
<td>Water Recycled between CSBP plants</td>
<td>18,000</td>
<td>22,000</td>
</tr>
</tbody>
</table>

Notes:
1. CSBP has reduced scheme water use from over 600,000 kl/year 4 years ago, and does not favour extending scheme water use for this project.
2. This relatively high quality water is supplied under contract by Western Power to CSBP for industrial use.
3. The 2.33 Gl of artesian water used includes a supply to the ammonia plant cooling tower which has reduced during 03/04, and approximately 900,000 kl supplied to Tiwest to displace scheme water from its process. CSBP’s intention is to maintain this sustainable supply to Tiwest to the extent possible after implementing this proposal.
4. CSBP’s preference is to use KWRP water (an additional supply) for this proposal (cooling tower use), but this has to be subject to a satisfactory agreement being reached with the WA Water Corporation. In the event this is not possible then CSBP has access to other sustainable sources that can be used as described in the volume ranges in the Table.

With the factors described above the exact mixture of water sources for the nitric acid plant cooling tower is difficult to predict now, because even with a treated source like Kwinana Water Reclamation Plant (KWRP) other waters have to be blended to prevent corrosion damage to the cooling tower. However, given the uncertainties the volume ranges above will provide sustainable resources for the project – in the event that KWRP water is used then the artesian water harvested could reduce further dependent upon the supply to Tiwest.

CSBP currently utilises over 3,000 ML/year of water for plant processes at Kwinana. The use of potable scheme water for plant processes is minimised wherever possible. Scheme water usage at CSBP has continued to decrease over recent years through the application of reuse options onsite and with neighbouring industry. In 2003, CSBP was selected by the Water Corporation of WA to be part of their “Water Hero” campaign in recognition of initiatives to reduce scheme water usage.

CSBP is also a foundation client of the KWRP. The KWRP will supply (tertiary treated) high quality industrial grade water following treatment of wastewater from the Woodman Point wastewater treatment plant. Water from the KWRP will be supplied to purchasers in the KIA to replace potable scheme water use in industrial
processes (Water Corporation, 2003). Approximately, 730 ML/year of water will be sourced by CSBP, predominantly for cooling towers, from the KWRP.

CSBP holds a water abstraction licences which permits the extraction of 4,300 ML. Annual abstractions from these bores, whilst consistently below licence limits, has gradually increased over the years. This is mainly due to scheme water saving initiatives between CSBP and its neighbours where a significant volume of artesian water is sent ‘across the fence’ to industries such as Tiwest. The initiative has seen a net benefit of reduced scheme water use by our neighbouring industries of up to 1,500 ML/yr based on 2002/3 abstraction data (Wesfarmers Limited, 2003).

6.10.3 Assessment of Impact

The proposed expansion will result in an increase in annual water consumption to meet process demands. CSBP believes that the preferred outcome for this project is to use recycled water from the KWRP, subject to satisfactory negotiations with the Water Corporation of WA (WAWC) to extend CSBP’s off take of KWRP water. In the event this source is not feasibly available, then CSBP believes it has sufficient access to sustainable groundwater (superficial and artesian aquifers) to resource the water needs of this proposed project (estimated at 0.7GL to 1.3GL per year depending on water source). The use of scheme water is CSBP’s least preferred alternative.

Despite the current abstraction rates of groundwater from the Yarragadee aquifer to supply both CSBP and neighbouring industry with water, there is sufficient capacity within the aquifer to ensure that process water requirements can be met without exceeding licence limits. Accordingly, whilst CSBP’s preference would be to utilise recycled water from the KWRP, CSBP is confident that alternative water sources are available to satisfy projected plant water demands. This alternative would require additional treatment chemicals and the installation of a dedicated (Reverse Osmosis) treatment plant onsite. Such a treatment plant would also generate additional liquid and solid wastes such as backwash water requiring disposal to SDOOL (the wastewater will meet the SDOOL standard levels as part of CSBP’s total effluent stream).

6.10.4 Environmental Outcome

CSBP is confident that viable options exist to ensure adequate supply of water. As part of CSBP’s commitment to the KWRP, the use of treated industrial grade water sourced from the KWRP is considered the most preferable source of water for the project, subject to environmental, technical and commercial factors. This would be supplemented with water abstracted from sub-artesian wells in the Yarragadee aquifer. CSBP plans to continue to supply neighbouring industries with this water to offset their use of potable water, where practicable.

6.10.5 Environmental Commitments

*CSBP will source water for this project from either KWRP, or sustainable ground water supplies under licence.*
WAWC scheme water will not be used except in emergency or supply disruption situations.

CSBP will continue its internal programmes directed at increasing water use efficiency and source protection.

6.11 Public Risk

6.11.1 Environmental Objective

Ensure that risk from the proposal is as low as reasonably achievable and complies with acceptable standards and EPA criteria (EPA, 2002a).

6.11.2 Applicable Standards, Guidelines or Procedures

The EPA stipulates acceptable risks to which individuals in Western Australia can be subjected. To meet these criteria, proponents must ensure that risk is as low as reasonably achievable and complies with the requirements in EPA Guidance for the Assessment of Environmental Factors No. 2: Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant (EPA, 2000).

In summary, the applicable criteria are based on ‘industrial facilities’ requiring that the chance (likelihood or probability) per year of a fatality as a result to exposure to site activities will not exceed fifty-in-a-million per year (50 x 10^-6/year) as defined in the EPA Guidance. The assumptions underpinning these standards are very conservative, and protective of public safety.

In relation to residential areas, the risk of a development to residents shall not exceed one in one million year (1x10^-6/year) per year.

Sensitive premises such as hospitals or aged persons accommodation has a higher degree of protection, being one half in one million year (0.5x10^-6/year) per year.

6.11.3 Existing Environment

A Quantitative Risk Assessment (QRA) of the ammonium nitrate plant was conducted in March 2002 to determine a base case for current risk levels from this facility (DNV, 2002). The main risk contributors identified in the QRA were related to potential releases of liquid ammonia from ammonia supply pipelines.

The existing QRA studies show that risk profiles for the Ammonium Nitrate Production Facility are within the EPA guidelines. The one exception to this is the historical exceedance onto the BP refinery land to the west of the CSBP’s industrial complex, created by the very close alignment of some facilities previously owned by BP to the remaining BP landholdings. CSBP has addressed this to an extent through leasing some land from BP for a wetland and is in the process of creating an agreement with BP for training their limited number of staff who work in the area subject to elevated risk levels.
As part of this proposal, the existing 900 tonne high strength (90%) ammonium nitrate liquid tank is being transformed to a 70% ammonium nitrate liquid tank (for fertiliser manufacture), and this in turn will significantly reduce the “knock on” potential of any incidents, and hence the modelled risk of the facilities. The 900 tonne ammonium nitrate liquid tank is to be replaced by a 310 tonne (approx.) tank; the design of which will include all contemporary safety factors.

CSBP have commissioned Qest Consulting to revise the previous QRA of the current Ammonium Nitrate Production Facility using updated tools and minimize methods. The updated model shows that the Ammonium Nitrate Production Facility complies with the EPA risk criteria and exhibits a slightly reduced risk profile when compared to the previous model. The reasons for this are detailed in the Kwinana Works Total Site Quantitative Risk Assessment, which for security reasons, is not included in this PER.

On the Ammonium Nitrate Production Facility, the main risk contributors are release gases from streams containing ammonia or mixed nitrous oxides. The one explosion event that has offsite effects (the explosion of the ammonium nitrate solution storage tank) only generated low levels of risk. These results demonstrate that the risks exhibited by the current Ammonium Nitrate Production Facility, considered on its own, lie within the tolerable As Low as Reasonably Practicable (ALARP) region according to the EPA criteria. It should be noted that the EPA criteria refer to cumulative risk.

6.11.4 Assessment of Impact

CSBP commissioned a Preliminary Risk Assessment (PRA) from Qest Consulting. A summary of the Qest Consulting PRA is presented in Appendix 5. The PRA addresses the proposed expansion of the Ammonium Nitrate Production Facility at the CSBP Kwinana industrial complex. Three expansion layout options have been considered using the methodology required under the Public Environmental Review (PER) submission process prescribed by the Western Australian (WA) Environmental Protection Agency (EPA, 2000).

The CSBP Kwinana industrial complex is a Major Hazard Facility because it manufactures, handles & transports materials at tonnages greater than the threshold quantities specified by the DoIR. The DoIR requirements are consistent with the requirements of National Standard NOHSC: 1014 and the associated National Code of Practice.

In accordance with the compliance requirements for Major Hazard Facilities in WA, CSBP maintains a Quantitative Risk Model of the CSBP Kwinana industrial complex in order to:

1. better understand the potential for Major Accidents at the facility in terms of consequence and likelihood;
2. tailor activities at the facility so that, cumulatively, these risks are minimize to levels that can be considered ALARP; and

3. demonstrate compliance with the risk criteria applied to such facilities in WA.

The conclusions drawn with regard to the risk profile have been the product of an orthodox QRA methodology supplemented by the following activities:

- Formal workshops with CSBP staff to confirm the suitability of input data and review the relative ranking of risks.

- A complete revision of ammonium nitrate explosion consequence models in keeping with research from post-Toulouse investigations and current heightened community concern.

- A series of sensitivity tests were carried out where good practice warranted specific investigation.

**Cumulative Risk**

The effect of the proposed Ammonium Nitrate Production Facility expansion on the whole site risk must be presented in the context of the current whole site risk as shown in Figure 2.1 of Appendix 5. As is shown, the EPA criteria are exceeded at the points marked as “Boundary Fence Points 1 & 2”, the responses to which are presented in the Kwinana Works Total Site Quantitative Risk Assessment [Qest-CSB18P 2004] and minimized as:

- Boundary Fence Point 1: CSBP and BP personnel have implemented a liaison process with regard to Emergency Response Planning, with BP personnel working within this area inducted into the CSBP safety management system, ensuring they know how to respond appropriately.

- Boundary Fence Point 2: The extent of the exceedance is limited (several meters) and within the rail corridor between CSBP and Coogee Chemicals. Hence there is minimal chance for off-site populations to be affected as there is limited access the rail corridor, given the limited access, short exposure duration of trains and the Emergency Response Plan, which warns trains if a release occurs. Finally the consequence minimize uses a ‘best estimate conservative’ approach to the analysis, which never knowingly underestimates and hence can be safely considered to contain an element of conservatism.

However, the PRA is concerned with the cumulative effects that the proposed expansion of the Ammonium Nitrate Production Facility (covering the current and additional ammonium nitrate plant, the prill plant, prill storage and jetty operations) will have on the whole site contours. To demonstrate this, the cumulative risk contours of the current and proposed whole site risk are shown in Figure 3.1 and Figure 3.2 of Appendix 5. What is demonstrated is that long distance low-level risk from the north western portion of the site is reduced in the proposed whole site risk.
This is due to changes proposed as part of the Ammonium Nitrate Production Facility expansion.

The proposed change to reduce the ammonium nitrate solution storage tank in size (from 900 to 310 tonnes/250 m³) and relocate it to the east of the property prevents the explosion of the ammonium nitrate tank causing failure of the refrigerated ammonia tanks. As a result this also removes the “knock-on” frequency associated with the ammonia tank failure case, which is a significant portion of the total tank rupture frequency. Accordingly, the long distance effects of the ammonia storage tank rupture reduce in risk to such a level as to be below the EPA criteria of concern.

**Expanded Ammonium Nitrate Facility**

The assessment of the expanded facility considered three proposed configurations and it concluded that all three options comply with the EPA risk criteria. The process involved for each of the three layouts are the same, only the location of the plant sections is altered compared to the existing facility. The process changes are:

- Addition of a second nitric acid/ammonium nitrate plant as a duplicate of the current plant and located roughly 75 m NNE of the current plant.

- The 730m³ (equivalent to 900 tonnes) 91% ammonium nitrate solution storage tank will be replaced with a 250m³ (equivalent to 310 tonnes) tank, which will be located in one of the places suggested in the site layout options. The 730m³ tonne ammonium nitrate solution storage tank will store 70% solution, which is not classified as a dangerous good.

- An additional prill plant 50% larger than the existing plant will be constructed, located in one of two places suggested in the site layout options.

- The storage of bulk and bagged prill will not be increased but rearranged with the potential for relocation to one of three places within the project envelope. A small export transit store to be based west of the current prill storage.

- Bagged prill will be exported from the Kwinana Bulk Jetty North Arm up to 24 times a year in 4000 tonne shipments, in addition to the 12 shipments a year currently allocated to Dyno Nobel.

Since the three layout options only change the location of the ammonium nitrate solution storage, prill plant and prill storage, the offsite risk from the three layout options does not change. This is because ammonium nitrate hazards from those sections of plant do not contribute significantly to offsite risk, hence their movements with different layout options does not vary the offsite risk.

In addition, it has been demonstrated that the risk from the ammonium nitrate solution storage tank will be significantly reduced by the CSBP decision to reduce the new ammonium nitrate solution tank in size (to 310 tonnes) and relocate it to the east of the property. This action will remove the risk of a possible ammonium nitrate tank explosion causing failure of the refrigerated ammonia tanks.
The risk from the proposed export of bagged ammonium nitrate prill (ANP) from the North Arm of Kwinana Bulk Jetty is a part of the total jetty risk, comprised of:

- the existing nine (9) ammonia transfers per year by CSBP;
- the twelve (12) ANP exports per year allocated to Dyno Nobel; and
- the proposal for up to twenty-four (24) CSBP ANP exports per year.

The explosion risk from the proposed total thirty-six (36) ANP exports (limited to 4,000 tonnes per shipment) is shown in comparison to the toxic risk contours (Figure 3.3 of Appendix 5). Accordingly, the risk is demonstrated to lie within the tolerable ALARP region according to the EPA criteria.

### 6.11.5 Environmental Outcome

The Qest Consulting assessment shows that the risk levels posed by the current and proposed expanded ammonium nitrate facilities, meet the Regulatory Risk Criteria (EPA, 2000). The primary risk driver for the current Ammonium Nitrate Production Facility is confirmed to be explosions from the Ammonium Nitrate Solution Storage Tank. For the new expanded facility this tank has been sized for a smaller operating inventory (40% of current practice) and would be located farther away from the refrigerated ammonia storage tanks. The reduction in risk that this design feature affords is significant.

Additional import/export activities at the Kwinana Bulk Jetty also satisfy the EPA Risk Criteria. Wells Park, the nearest location to which the public has access, would not be exposed to significant consequences from a major accident at the facility.

The changes proposed as a part of the Ammonium Nitrate Production Facility expansion reduce the cumulative risk profile for the Kwinana industrial complex. This is due to the proposed reduction in size and eastward relocation of the ammonium nitrate solution storage tank. This action prevents any ammonium nitrate solution storage tank explosions damaging the refrigerated ammonia storage tanks and causing subsequent ammonia releases, hence reducing the risk profile for the whole industrial complex.

The PRA is not sensitive to the three proposed layout options assessed because they have no significant impact at the site boundary and are very similar when considered on the overall geographic scale.

Safety features already incorporated into the existing Ammonium Nitrate Production Facility will be incorporated into any new facilities. All plant operators and maintenance employees will be trained in the safe work practices and emergency procedures appropriate to the operation of the plant and handling of all associated materials.

Prior to commissioning the operating manual and procedures covering all process work, including start-up, and shut-down, plant testing, maintenance, inspection and emergency action will be updated. The potential hazards identified will be reviewed
and appropriate contingency measures incorporated into existing on-site and off-site emergency procedures for the Kwinana industrial complex.

CSBP maintains a close working relationship with the Fire & Emergency Services Authority (FESA) and has a service agreement. FESA provides backup to CSBP personnel in emergency response situations and regularly visits the CSBP industrial complex for training and familiarisation purposes.

On-site emergency facilities at CSBP’s Kwinana works will continue to include a dedicated emergency response vehicle, fire tender and a patient transfer vehicle at all times, and an occupational health nurse during normal working hours. The emergency response vehicles and resources will be available to service any off-site incident.

6.11.6 Management Commitments

*The proponent will continue to maintain a safety report as described under the national standard “control of major hazard facilities”, as required by the facility’s dangerous goods licence or other relevant legislation with the advice of the DoIR to provide the framework to ensure that the facility emergency response is appropriate to respond to all scenarios.*

*CSBP will obtain and maintain the relevant Dangerous Goods Licences for this facility.*

*CSBP will relocate and decrease the size of the high strength ammonium nitrate solutions tank, in accord with the modelling undertaken for the Preliminary Risk Assessment by QEST.*

6.12 Traffic and Shipping

6.12.1 Environmental Objective

To ensure that any increases in traffic and shipping do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

6.12.2 Existing Environment

*Road Traffic*

Both employees and movements of feedstock and manufactured products in and out of the CSBP Kwinana industrial complex generate traffic movements.

A summary of the published traffic volume data from 1992 to 1999 collected by Main Roads WA for Kwinana Beach Road and Patterson Road is presented in Table 28. The Main Roads data shows that in 1998/99 there were almost 6,000 traffic movements per day at the railway crossing on Kwinana Beach Road. It is expected that there has been an increase in traffic movement on Kwinana Beach Road in the
last five years and even if this increase is conservatively estimated at 10% this would mean that the current traffic movement on Kwinana Beach Road is approximately 6,600. This data has been confirmed as being representative of current traffic levels by a 3 day traffic count at the entrance of the CSBP industrial complex completed by CSBP over the period 23-25 November 2004.

Based on this traffic movement count there are approximately 1400-road traffic movements per (usual business) day from the CSBP Kwinana industrial complex at present.

<table>
<thead>
<tr>
<th>Location</th>
<th>AAWT&lt;sup&gt;1&lt;/sup&gt;</th>
<th>2004 (Nov)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kwinana Beach Rd At rail crossing</td>
<td>4390</td>
<td>4610</td>
</tr>
<tr>
<td>Kwinana Beach Rd At the entrance to CSBP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patterson Rd West Of Mandurah Rd</td>
<td>33620</td>
<td>34830</td>
</tr>
<tr>
<td>Patterson Rd South of Office Rd</td>
<td>33190</td>
<td>37030</td>
</tr>
<tr>
<td>Patterson Rd West of Ennis Ave</td>
<td>12110</td>
<td>12930</td>
</tr>
</tbody>
</table>

Notes:
1. AAWT means Main Roads metropolitan annual average weekday traffic flow.

During periods of construction activity there are periods of increased traffic movements as a result increased workforces on the site and movements of equipment and waste to and from the CSBP industrial complex.

Shipping

Currently there are few shipping movements into or out of Cockburn Sound as a result of the operation of the Ammonium Nitrate Production Facility.

There are approximately 8 shipping movements per year associated with the import of liquid fertiliser (Flexi –N).

In the last 2 years there have been four shipping movements associated with the import or export of ammonia from the expanded ammonia business. These shipments are conducted in accordance with the requirements of an environmental approval,
which allows up to nine shipments (18 ship movements) of ammonia into or out of the CSBP facility per year.

6.12.3 Assessment of Impact

Road Traffic

The potential ongoing traffic increase resulting from this proposal are estimated to be 30 light vehicles, and 10 heavy vehicles per day, which is insignificant in the context of traffic movements on Kwinana Beach Road and Patterson Road.

During the construction phase, which will extend over approximately 15 months, there will be an increase of approximately 150 light vehicles, and 10 heavy vehicles per day, which again is insignificant in the context of current traffic movements on Kwinana Beach Road and Patterson Road.

Shipping

As a result of the implementation of this proposal there will be a modest overall increase of approximately 50 shipping movements per year into Cockburn Sound.

The increase will be comprised as follows:

- a reduction approximately 8 to 10 shipping movements (4 to 5 shipments) per year as a result of imported liquid fertiliser shipments being replaced by production at Kwinana;

- a potential increase of approximately 50 shipping movements from 25 export shipments of ammonium nitrate per year (at present ammonium nitrate shipments are very infrequent); and

- there will be an increase of about 10 shipping movements (5 shipments) to cater for the need for sufficient ammonia feedstock during peak production periods.

These changes are not regarded as significant in the context of the overall annual average number of shipping movements in Cockburn Sound which total approximately 1,900 per year (D.A. Lord & Associates, 2001, p85).

6.12.4 Environmental Outcome

There will be a slight increase in the number of road traffic and shipping movements as a result of this proposal being implemented. The increases are relatively small in the context of the exiting traffic movements and are therefore not expected to averse any impact on environmental values.

It is important to note that the shipments of ammonia will continue to conform to the limits imposed under previous environmental approvals.
6.12.5 Management Commitments

*CSBP will limit the number of shipments of ammonia to a maximum of 9 per year.*

*CSBP will limit potential ammonium nitrate exports to no more than 25 ships each up to 4,000 tonnes per ship.*

6.13 Visual Amenity and Light Overspill

6.13.1 Environmental Objective

Ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable (EPA, 2002a).

To avoid or manage potential impacts from light overspill and comply with acceptable standards (EPA, 2002a).

6.13.2 Applicable Assessment Standards or Procedures

The applicable Australian Standard for light overspill is AS 4282 *Control of the Obtrusive Effects of Outdoor Lighting*. There are no applicable standards for visual amenity as this factor is very specific to individual community concerns.

6.13.3 Existing Environment

The existing ammonium nitrate facility is located within the centre of the CSBP industrial complex. The premises are currently not visible from publicly accessible areas other than for the prilling tower and absorber stack. Nonetheless, a range of industries surrounds the site.

Potential impacts for light overspill will be minimised, as far as practicable, through strategic positioning of light poles and towers and utilisation of directional lighting. Where any additional light sources are installed, these installations will be in accordance with AS 4282.

6.13.4 Assessment of Impact

A new prilling tower and stack will be a maximum 65m in height.

CSBP conducted a view-shed analysis to assess the likely visual intrusion of the expanded Ammonium Nitrate Production Facility taking into account surrounding land use and topography.

Results of view-shed analyses of the “expanded Ammonium Nitrate Production Facility” are illustrated in Plates 1 to 3 and suggest that the visual impact of the expanded Facility will be minimal in the context of the surrounding land use. Observation points used to assess potential visual impacts are shown on Figure 6.
6.13.5 Environmental Outcome

The relatively small footprint (compared to existing industrial facilities at the CSBP industrial complex), implementation of sympathetic colour schemes together with the use of screening where possible, will ensure that the EPA’s objectives in relation to visual amenity are met.

6.13.6 Management Commitment

*To improve the visual amenity of the proposed expansion, the following management strategies will be undertaken where appropriate:*

- buildings will be colored in accordance with CSBP’s usual standards for industrial plant;
- good housekeeping practices will be maintained at all times; and
- lighting will comply with Australian Standard AS 4282.
TABLE 29
SUMMARY OF RELEVANT ENVIRONMENTAL FACTORS RELATING TO PROPOSED AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION

<table>
<thead>
<tr>
<th>Environmental Factor</th>
<th>Relevant Area</th>
<th>Environmental Objective</th>
<th>Potential Environmental Impacts/Proposal Characteristics</th>
<th>Proposed Mitigation and Management Strategies</th>
<th>Predicted Outcome</th>
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<tbody>
<tr>
<td>Biophysical</td>
<td></td>
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<tr>
<td>Surface Water</td>
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<td>There are no permanent natural surface water bodies within the CSBP Kwinana industrial complex. The main environmentally sensitive water body within close proximity to the industrial complex is Cockburn Sound. The CSBP industrial complex process wastewater, in the form of cooling tower blowdown and stormwater runoff, is directed to Cockburn Sound via a submarine pipeline at the average rate of 1.5 ML/day. Wastewater from plant wash down and process condensate is generally recycled within the plant or used in the superfosphate manufacturing plants. The only exception being some wash down waters from the prilling plant which cannot currently be captured in a form that is suitable for recycling and are therefore discharged into the CSBP liquid effluent system and subsequently discharged currently to Cockburn Sound after treatment and monitoring.</td>
<td>CSBP plan to discharge process water (consisting mainly of cooling blowdown water) from the site via the SDOOL. The EPA assessed the cumulative impacts of discharges to the SDOOL, which include those from CSBP, and recommendations for approval were presented to the Minister for the Environment in Bulletin 1135 (EPA, 2004c). The Minister for the Environment gave final approval to WAWC to dispose of industrial effluent through the SDOOL on the 28 November 2004. It is expected that disposal of industrial effluent through the SDOOL will commence in February 2005 (this approval included CSBP’s effluent stream using the existing CSBP Environmental Protection Licence, which is itself protective of Cockburn Sound values).</td>
<td>The nitrogen effluent emissions from the CSBP industrial complex will not exceed the existing site’s 3-month rolling average as at 30 June 2004 (which is itself historically low, and well within the ambient loads foreshadowed by the Draft State Environmental (Cockburn Sound) Policy 2004).</td>
</tr>
</tbody>
</table>

The main source of process water requiring onsite disposal is from the ammonia plant cooling tower blow down water, which is currently generated at approximately 1 ML/day. This cooling tower blow down water, together with any wash down water that cannot be recycled is routinely directed to the submarine pipeline and then discharged (currently –December 2004) to Cockburn Sound. Blowdown water can also be directed to the environmental ponds. Manual analysis of water quality in the blowdown water is undertaken on a weekly basis by a contracted third party. A series of online samplers continuously analyse effluent from the submerged pipeline for pH, nitrogen, and phosphorus. Where elevated levels are detected, an automated system ensures that the environmental pond pumps will trip halting discharge to Cockburn Sound.

Drainage for stormwater runoff is independent of the process water streams. Stormwater is directed to a collection sump via a series of box drains. This is then directed to the ocean outfall only if contaminant concentrations are within acceptable trigger levels. Nitrogen, pH, and phosphorus concentrations in the stormwater are monitored using a series of online analysers strategically located at key points along the stormwater drains. Where levels exceed trigger levels (nominally 30% of licence limits), drawdown pumps at the collection sump ‘cut off’ thereby preventing further discharge of contaminants to the outfall.

Other than cooling tower blow down water, process wastewater generated from the nitric acid plant (as well as other plant facilities) is directed to dedicated collection sumps. This water is pumped to the environmental storage tanks and may be reused in the CSBP granulating plant or discharged to Cockburn Sound.

Despite the robust nature of the site surface water management system, CSBP recognises there is always a potential for accidental releases of process fluids or effluent that could lead to a discharge of contaminants. Accordingly, emergency response plan and management procedures have been developed to address a range of potential incidents such as spills, fire, transport accidents etc that could result in the release of pollutants to surface waters and Cockburn Sound. Additionally, CSBP is committed to the KIMA agreement including various local industries within the Kwinana industrial estate, established to provide a combined industry response to emergency situations, as part of its leadership of the Kwinana Industries Public Safety group.

CSBP will design the proposed plants to initially reduce wastewater generation, and then to capture and recycle as far as possible all wastewater in the plant, or in the rest of CSBP’s site. The existence of the pilot nutrient stripping constructed wetland and CSBP’s other water recycling initiatives will aid this endeavour.
<table>
<thead>
<tr>
<th>Environmental Factor</th>
<th>Relevant Area</th>
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<tr>
<td>Water Resources</td>
<td>Ammonium Nitrate Facility.</td>
<td>Minimise the impact on natural water resources by minimising consumption and reusing wastewater where feasible and to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected</td>
<td>The exact mixture of water sources for the nitric acid plant cooling tower is difficult to predict now, because even with a treated source like (KWRP) other waters have to be blended to prevent corrosion damage to the cooling tower. However, given the uncertainties the volume ranges above will provide sustainable resources for the project – in the event that KWRP water is used then the artesian water harvested could reduce further dependent upon the supply to Tiwest. CSBP currently utilises over 3,000 ML/year of water for plant processes at Kwinana. The use of potable scheme water for plant processes is minimised wherever possible. Scheme water usage at CSBP has continued to decrease over recent years through the application of reuse options onsite and with neighbouring industry. In 2003, CSBP was selected by the WAWC to be part of their “Water Hero” campaign in recognition of initiatives to reduce scheme water usage. CSBP is also a foundation client of the KWRP. The KWRP will supply (tertiary treated) high quality industrial grade water following treatment of wastewater from the Woodman Point wastewater treatment plant. Water from the KWRP will be supplied to purchasers in the KIA to replace potable scheme water use in industrial processes (Water Corporation, 2003). Approximately, 730 ML/year of water will be sourced by CSBP, predominantly for cooling towers, from the KWRP. CSBP holds a water abstraction licences which permits the extraction of 4,300 ML. Annual abstraction from these bores, whilst consistently below licence limits, has gradually increased over the years. This is mainly due to scheme water saving initiatives between CSBP and it’s neighbours where a significant volume of artesian water is sent ‘across the fence’ to industries such as Tiwest. The initiative has seen a net benefit of reduced scheme water use by our neighbouring industries of up to 1,500 ML/yr based on 2002/3 abstraction data (Wesfarmers Limited, 2003).</td>
<td>The proposed expansion will result in an increase in annual water consumption to meet process demands. CSBP believes that the preferred outcome for this project is to use recycled water from the KWRP, subject to satisfactory negotiations with the WAWC to extend CSBP’s off take of KWRP water. In the event this source is not feasibly available, then CSBP believes it has sufficient access to sustainable groundwater (superficial and artesian aquifers) to resource the water needs of this proposed project (estimated at 0.7GL to 1.3GL per year depending on water source). The use of scheme water is CSBP’s least preferred alternative. Despite the current abstraction rates of groundwater from the Yarragadee aquifer to supply both CSBP and neighbouring industry with water, there is sufficient capacity within the aquifer to ensure that process water requirements can be met without exceeding licence limits. Accordingly, whilst CSBP’s preference would be to utilise recycled water from the KWRP, CSBP is confident that alternative water sources are available to satisfy projected plant water demands. This alternative would require additional treatment chemicals and the installation of a dedicated (Reverse Osmosis) treatment plant onsite. Such a treatment plant would also generate additional liquid and solid wastes such as backwash water requiring disposal to SDOOL (the wastewater will meet the SDOOL standard levels as part of CSBP’s total effluent stream).</td>
<td>CSBP is confident that viable options exist to ensure adequate supply of water. As part of CSBP’s commitment to the KWRP, the use of treated industrial grade water sourced from the KWRP is considered the most preferable source of water for the project, subject to environmental, technical and commercial factors. This would be supplemented with water abstracted from sub-artesian wells in the Yarragadee aquifer. CSBP plans to continue to supply neighbouring industries with this water to offset their use of potable water, where practicable.</td>
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<td>Environmental Factor</td>
<td>Relevant Area</td>
<td>Environmental Objective</td>
<td>Potential Environmental Impacts/Proposal Characteristics</td>
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<tr>
<td>Pollution Management</td>
<td>Ammonium Nitrate Facility</td>
<td>Ensure that gaseous emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).</td>
<td>CSBP uses the ammonia-oxidation process, the most commonly used process in the world (USEPA, 1991), to produce nitric acid. The absorption tower, common to all ammonia-oxidation nitric acid production facilities, is the primary source of NO X (waste/tail gas) emissions. Besides the NO X emissions there may also be some fugitive emissions of ammonia and nitric acid vapours but it is expected that the quantities emitted will not be significant (InfoMil, 1999). The NO X emissions are continuously vented to the atmosphere through a stack on the absorption tower. The emission of NO X occurs because the absorption section of a nitric acid plant – where NO X are absorbed in water to form nitric acid – is not 100% efficient. Research has shown that NO X emissions from nitric acid plants range from 100 to 3,500 ppmv (parts per million by volume), with an average of 200 to 500 ppmv (van den Brink et al., 2002; EFMA, 2000a). The European Fertilizer Manufacturers’ Association (EFMA) (2000a) recommends extended absorption and SCR as best available technology (BAT). The EFMA provides BAT emission levels for a nitric acid plant as 100 ppmv (parts per million by volume) which is equivalent to 0.65 kg NO X (expressed as NO2) per tonne of 100% nitric acid product, achieved either by use of SCR or extended absorption. For medium pressure plants such as that used by CSBP the normal NO X reduction technology used is SCR. The European Environment Agency (EEA) sets a limit value for new nitric acid plants of 350 mg/Nm3 (equivalent to 170 ppmv if all NO X is present as NO2) (EEA, 2005). The new nitric acid plant will operate at the same performance standards as the existing plant. This plant, operating since 1996, has consistently achieved NO X concentrations of 100 mg/Nm3 (50 ppmv), well below current BAT standards. When planning the existing nitric acid plant in 1993, CSBP staff undertook a world tour inspecting operating nitric acid plants to determine what technologies were available. The objective, in terms of NO X, was to achieve a colourless stack. At this time it was accepted that the best available technology was the recently developed SCR route, and plants were operating with this system at NO X concentrations of 200 ppm and above. From the plant inspections CSBP realised that the stack emission was still visible at 200 ppm, and hence this did not meet the objective. Following detailed technical discussions with potential nitric acid technology providers, it was determined that the new plant could be designed to achieve 50 ppm NO X and this was specified in the plant design contract. The plant continues to operate at this NO X concentration, which is still well below accepted European standards. The basis of the SCR technology is the addition of ammonia to the process gas in the presence of a selective catalyst. The ammonia converts the NO X (both NO2 and NO) to nitrogen but there is a practical limit to this reaction and to achieve very low NO X concentrations risks having significant free ammonia in the exit gases. This is not a desirable outcome and hence CSBP operates the plant at the 50 ppm NO X level. CSBP’s existing nitric acid pant, using SCR typically emits at NO X at approximately 50 ppmv, which is below the accepted standards for these plants (Environmental Protection Licence limit for the existing plant is 974 ppm). The duplicated nitric acid plant will emit NO X at similar quantities therefore no management strategies other than the SCR are being considered.</td>
<td>The results of the air dispersion modelling in relation to NO X emissions indicate that there should be no significant impacts associated with the expansion of the Ammonium Nitrate Production Facility. Ground level concentrations of NO X are predicted to be higher than the current operating scenario, but the increases will not result in an exceedance of the NEPM guideline. Ozone monitoring studies completed by the DoE suggest that industry emissions from the Kwinana industrial area are not a defining factor in photochemical smog production in the Perth airshed. Based on a qualitative analysis, the following factors suggest that the increased emission of NO X due to the Ammonium Nitrate Production Facility expansion will not be significant:  - In relative terms, the increase NO/NO2 emissions are minor when compared with existing background levels in Kwinana and the greater Perth airshed.  - NO/NO2 are present at one to one (1:1) molar ratio in the tail gases from the nitric acid plant and therefore should not upset the existing equilibrium in the main photochemical smog reactions.  - Recent studies suggest motor vehicle emissions, not industrial emissions are the principal cause of photochemical smog in Perth.</td>
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<tr>
<td>Environmental Factor</td>
<td>Relevant Area</td>
<td>Environmental Objective</td>
<td>Potential Environmental Impacts/Proposal Characteristics</td>
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<tr>
<td>Air Quality – Ammonium Nitrate Emissions</td>
<td>Ammonium Nitrate Facility.</td>
<td>Ensure that emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).</td>
<td>The nearest sensitive residential premises, are located approximately 3km to the east of the site in Medina and Calista. The nearest sensitive marine environment is Cockburn Sound, which is immediately adjacent to the CSBP industrial complex western boundary. The primary source of particulate emissions from the existing Ammonium Nitrate Production Facility is the prilling plant (includes both the prill tower and drying train) where liquid ammonium nitrate is converted into small drops, which when cooled form a solid sphere referred to as ‘prill’. EFMA (2000b) provides BAT emissions for the prill drying train as 30 mg/Nm³ particulate and for the prilling tower, as 15 mg/Nm³ particulate. However, it should be noted that this refers to fertiliser grade prilling towers, which have a high emission of fine particulate without abatement measures. Without abatement the particulate can be up to 200 mg/Nm³. To achieve the low particulate concentration for a prilling tower under BAT it is necessary to fit very specialised aerosol filter systems. To CSBP’s knowledge such systems are not fitted to the existing prilling plant CSBP will retrofit appropriate pollution prevention equipment on the existing prilling plant to meet a target particulate emission goal of 100 mg/m³. CSBP aims to ensure that particulate emission concentrations from the new plant will not exceed 50% of those prescribed in current licence limits with maximum emission concentrations from the prilling plant of 0.05 g/Nm³. The current licence prescribes a particulate limit of 0.25 g/Nm³ for the prilling tower and pre-dryer, and 0.35 g/Nm³ from the dryer. It is anticipated that even with increased prill production, the new plant will decrease current emission loads through the implementation of appropriate technology for particulate control. Should the decision be made to continue to run the existing prilling plant CSBP will retrofit appropriate pollution prevention equipment on the existing prilling plant to meet a target particulate emission goal of 100 mg/m³.</td>
<td>CSBP’s proposed modifications to the existing prilling plant will see a net reduction in the total particulate emissions but it is assumed that the fine (PM₁₀) fraction of the emission from the existing prilling plant will remain unchanged. The concurrent operation of the upgraded existing plant and the proposed new plant is predicted to result in a small increase in the ambient PM₁₀ concentrations but these ambient concentrations are only a small fraction of the NEPM PM₁₀ standard. As such it is unlikely that the emission of fine particulate from the existing and proposed ammonium nitrate plants will have any significant environmental or health impacts. Even if the total particulate emission is assumed to be PM₂.₅ the proposal is still well within the (lower) interim NEPM values. The particulate deposition on Cockburn Sound under either expansion scenarios for the Ammonium Nitrate Production Facility is predicted to be lower than the deposition from the existing Facility.</td>
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<tr>
<td>Air Quality – Ammonia Emissions</td>
<td>Ammonium Nitrate Facility.</td>
<td>Ensure that emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002a).</td>
<td>The KIC Phase 1 Screening Assessment assessed the long-term impacts of ammonia emissions from all major industries in Kwinana. The study predicted that the highest predicted ammonia ground level concentration at a community location would be at Wells Park, to the south of the CSBP site, and that the annual average concentration at this location would be approximately 50 µg/m³, half the USEPA ambient air criterion. Industry was considered to be the dominant contributor to ammonia at this location, with the CSBP contribution from all of its plants being approximately 6% of the total. The major emissions expected from the proposed new prilling plant are ammonium nitrate particulate and ammonia. CSBP commissioned ENVIRON to undertake a detailed modelling study to determine the significance of the impact from ammonia emissions under normal and worst-case plant operating conditions. The scope of this study was to model the dispersion characteristics and subsequent ground level concentrations of ammonia from the prilling plants in the existing and expanded scenarios. The predicted maximum ground level concentrations of ammonia at locations that are readily accessible to the public are in the order of 20 µg/m³ (1 hr average) and 0.3 µg/m³ (annual average). These are well below the ambient air quality criteria of 3,200 and 100 µg/m³ respectively. CSBP will monitor ammonia emissions from the new prilling plant and report the results to the DoE.</td>
<td>As the annual average ground level concentration of ammonia at Wells Park from all Kwinana industries is predicted to be approximately 50µg/m³ (half the USEPA ambient air criterion). The predicted increase of 0.3µg/m³ (annual average) is considered insignificant in a regional context.</td>
<td>Offsite ground level concentrations of PM₁₀ are not predicted to change significantly and particulate deposition rates over Cockburn Sound are predicted to decrease as a result of the implementation of the proposal.</td>
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<td>Environmental Factor</td>
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<tr>
<td>Greenhouse Gas Emissions</td>
<td>Ammonium Nitrate Facility</td>
<td>To minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions (EPA, 2002a).</td>
<td>The manufacture of ammonium nitrate at the CSBP Kwinana industrial complex contributes to the overall greenhouse inventory of the premises. Greenhouse gases are generated from the consumption of electricity and from emissions of N₂O from the nitric acid plant. In 2003/04, the existing Ammonium Nitrate Production Facility produced approximately 667,394 tonnes of net CO₂-e. The nitric acid plant emissions comprised approximately 97% of the total facility emissions, with the remainder associated with power consumption at the prilling plant and ammonium nitrate plant (the overall Ammonium Nitrate Production Facility actually exported electricity to the remainder of the CSBP Kwinana industrial complex to create a net saving of power generation emissions of CO₂-e of 15,413 tonnes CO₂-e). The existing nitric acid/ammonium nitrate plants are considered 'state of the art' in terms of energy efficiency. The nitric acid plant is a nett producer of electricity as a result of the exothermic nature of many of the chemical reactions used in the production of nitric acid. Worst-case greenhouse gas emissions from the expanded Facility have been estimated and the estimations are based on data weighted using the current production and design capability scenario to determine emissions from the expanded facility under maximum expected throughput. Based on this, the overall greenhouse emissions from the Ammonium Nitrate Production Facility will be over 1.5 Mtpa of CO₂-e (without taking into consideration the abatement and other commitments CSBP has made in this PER to reduce the greenhouse impact of this proposal). This represents an increase by approximately 132% of current (2003/04) emissions. Under the expansion, the nitric acid plant contribution to facility emissions will remain at approximately 97%. Notwithstanding, the greenhouse savings from nett power generation will increase by 137% from 15,412 tonnes CO₂-e to 36,579 tonnes CO₂-e. In comparison to the greenhouse inventory for the CSBP business as a whole, the contribution from the Ammonium Nitrate Production Facility will increase from 53% to 72% (assuming no change in contribution from other business units). Emissions of N₂O will continue to constitute the largest greenhouse emission component, contributing 74% of the total CSBP business emissions. The published data on N₂O emissions from nitric acid plants suggests that emissions of N₂O are typically in the range of 3-10 kg N₂O/tonne of nitric acid produced (0.93 – 3.1 CO₂-e/tonne of AN) produced (InfoMil, 1999). In 2003/04, CSBP’s nitric acid plant emitted N₂O at the rate of 11kg N₂O/tonne of nitric acid produced although the N₂O concentrations in the tailgas from CSBP’s current nitric acid plant (1040 to 1580 ppm) are in line with the range of concentrations quoted in the same reference. The plants producing the lower N₂O concentrations are high dual pressure plants, which are not commercially viable when compared to the medium mono pressure plants now being constructed around the world. N₂O emissions are highly dependent upon catalyst gauze conditions, which convert N₂O to NOx. CSBP is examining a range of measures at the design stage of the new nitric acid plant including the gauze system (size, shape and detailed design) and the boiler design with a view to reducing the N₂O emissions. At this stage it is not possible to make any definite commitments in relation to the impact of these changes but it is confidently asserted that some reduction will be achieved; i.e following the expansion, it is expected that the performance of the Ammonium Nitrate Facility will be equal to or better than that achieved in 2003/2004.</td>
<td>CSBP will submit a report to the EPA three months prior to the commissioning of the new ammonium nitrate facility reviewing the current state of testing of new N₂O emission catalysts. An update of this report will be submitted every two years until the new technology is adopted or the EPA advises that the report is no longer required. Notwithstanding the above, N₂O emissions from the existing and new nitric acid plants will continue to be monitored. A key initiative that will be undertaken in the existing and proposed nitric acid plant is the installation of on-line N₂O monitoring to better quantify emissions of this nature.</td>
<td>The overall greenhouse emissions from the expanded Ammonium Nitrate Production Facility will be over 1.5 Mtpa of CO₂-e (without taking into consideration the abatement and other commitments CSBP has made in this PER to reduce the greenhouse impact of this proposal).</td>
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### Environmental Factor | Relevant Area | Environmental Objective | Potential Environmental Impacts/Proposal Characteristics | Proposed Mitigation and Management Strategies | Predicted Outcome
---|---|---|---|---|---
Noise | Ammonium Nitrate Facility and immediate surrounding area. | To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet the Environmental Protection (Noise) Regulations 1997 (As Amended). | The nearest non-industrial noise sensitive premises is located approximately 3km east of the site at Medina. Noise attenuation measures implemented in various areas of the Ammonium Nitrate Production Facility to date have included installation of acoustic lagging on pipe work and intercoolers, silencers on plant boiler blowdown vents, lining of the compressor house with acoustic absorbent material to name but a few initiatives. Generally, these attenuation measures were implemented to reduce the area of high intensity noise (>100dBA) within the Facility, and achieve noise levels in occupancy areas within the CSBP industrial complex to less than 85dBA where practicable. The existing noise emissions fail to comply with the Regulation industrial receiver ‘assigned level’ of 65 L_{A10} mainly along the northern boundary of the ammonia plant. It is noted that were the Regulation ‘assigned levels’ to be changed in accordance with the recommendations of the “Noise Regulations Review: Outcomes of the Working Group Programme, June 2000”, or the proposed regulation changes as currently being proposed by DoE, then the existing noise levels at the BP Refinery boundary would be in compliance with the Regulations except for a small section next to the ammonia plant. Construction of a barrier fence (solid) could enable compliance at this location. CSBP commissioned Herring Storer Acoustics to develop an acoustic model to predict noise emission from the proposed Ammonium Nitrate Production Facility expansion at the CSBP Kwinana industrial complex. The acoustic model also includes the cumulative effect of other proposed expansions within the industrial complex, namely an upgrade of the sodium cyanide solids plant and sodium cyanide plant No.2 plants by Australian Gold Reagents (AGR). The AGR facility is located on land leased from CSBP but still within the industrial complex. | Noise level propagation to the surrounding noise sensitive areas has been modelled for plant operation noise and assessed against the Environmental Protection (Noise) Regulations 1997. The sound power levels used in the predictive minimize were based on measurements of existing plant and calculation of the likely sound power increases due to the AGR plant upgrade. The proposed expansion incorporates noise control by means of the acoustic enclosure of the existing and proposed nitric acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors. CSBP will monitor the plants for compliance with the industry to industry noise limits in the Regulations, as they are currently planned to be amended. In the event the Regulations for this industry to industry noise level are not amended CSBP will comply with the existing Regulations within 6 months of the Regulation review process ceasing. (It is relevant that the small area of the BP Refinery currently potentially subject to exceedance is not a permanent workplace for any person) CSBP will commit to constructing a noise barrier or similar on the northern boundary of the site to mitigate the slight exceedance onto BP’s land created by our ammonia plant in 2005. Noise emissions for the proposed new nitric acid, ammonium nitrate and prilling plants comply with the Regulation requirements at the nearest residential receiver locations. The acoustic minimize shows that the predicted noise emissions from the CSBP site (existing with proposed expansions) are well within the Regulation ‘assigned level’ of 35 L_{A10} for residential premises under ‘worst case’ night weather conditions. | Noise emissions for the proposed new nitric acid, ammonium nitrate and prilling plants comply with the Regulation requirements at the nearest residential receiver locations. The acoustic minimize shows that the predicted noise emissions from the CSBP site (existing with proposed expansions) are well within the Regulation ‘assigned level’ of 35 L_{A10} for residential premises under ‘worst case’ night weather conditions. In combination with other industrial noise emitters, the noise from CSBP is not a significant contributor for all locations except Medina. At Medina the noise from CSBP operations is predicted to be 31.0 L_{A10}, which is just significantly contributing to an exceedance of the assigned level of 35 L_{A10}. The predicted CSBP noise contribution of 31 L_{A10} is significantly less than the KIC predicted level of 48 L_{A10} (due to cumulative effect of all industry) and at a level of at least 15 dB(A) less than the KIC (SVT, 2001) predicted overall noise level, would be inaudible at Medina. The predicted noise levels at the nearest industrial premises (BP Refinery) currently exceeds the Regulation ‘assigned level’ of 65 L_{A10}. The predicted noise emissions are expected to increase up at the BP Refinery boundary. Both existing and predicted noise emissions are expected to comply with the proposed Regulation Review level of 70 L_{A10} (no characteristic adjustment required) criteria being pursued by the DoE. CSBP will commit to constructing a noise barrier or similar on the northern boundary of the site to mitigate the slight exceedance onto BP’s land created by our ammonia plant in 2005. |
### Environmental Factor: Solid Wastes

#### Relevant Area:
To achieve waste reduction, re-use and recycling outcomes which are environmentally, socially and economically sustainable (Waste 2020 TaskForce, 2001).

#### Environmental Objective:
Solid wastes produced on site as a part of the manufacturing process are held on site, assessed, and disposed of in accordance with the CSBP Waste Management Plan and procedures. Any wastes deemed as controlled wastes conform to DoE regulations for licensed disposal.

#### Proposal Characteristics:
The proposed expansion will result in the generation of additional wastes, during both the construction and operational phases. This is considered to be a minor impact and the additional waste volumes will be managed under the CSBP’s modified (to include construction waste management) Waste Management Plan and procedures.

Solid waste from the existing ammonium nitrate and prilling plants is negligible and this is not expected to change with the construction of the new ammonium nitrate and prilling plants. There is however some solid waste produced by the operation of the existing nitric acid plant and the new nitric acid plant will duplicate this.

#### Proposed Mitigation and Management Strategies:
- Solid wastes produced on site as a part of the manufacturing process are held on site, assessed, and disposed of in accordance with the site Waste Management Procedures. Any wastes deemed as Controlled Wastes conform to DoE regulations for licensed disposal.
- CSBP implements a waste recycling program that focuses on reducing waste to local landfill by recycling, re-use or reduction of waste. CSBP recycle or re-use steel, paper, oil, grease, pallets, batteries, rubber conveyor belts, drums, paper, plastics and grain waste from customers.
- CSBP is an active member of the Kwinana Industry Committee (KIC) Ecoefficiency Group. Through participation in the group, CSBP is involved in reviewing the potential for synergies between industry in the areas of waste and energy to take advantage of potential improvements in efficiency and contribute to sustainability in the region.

#### Predicted Outcome:
Given the nature of the expansion and the activities involved, the volume of solid waste generated will be insignificant with respect to the entire CSBP Kwinana industrial complex and will be managed according to the CSBP Waste Management Plan and relevant procedures.
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<tr>
<td>Social Surrounds</td>
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<td>A Quantitative Risk Assessment (QRA) of the ammonium nitrate plant was conducted in March 2002 to determine a base case for current risk levels from this facility (DNV, 2002). The main risk contributors identified in the QRA were related to potential releases of liquid ammonia from ammonia supply pipelines.</td>
<td>Safety features already incorporated into the existing Ammonium Nitrate Production Facility will be incorporated into any new facilities. All plant operators and maintenance employees will be trained in the safe work practices and emergency procedures appropriate to the operation of the plant and handling of all associated materials. Prior to commissioning the operating manual and procedures covering all process work, including start-up, and shut-down, plant testing, maintenance, inspection and emergency action will be updated. The potential hazards identified will be reviewed and appropriate contingency measures incorporated into existing on-site and off-site emergency procedures for the Kwinana works. CSBP maintains a close working relationship with the Fire &amp; Emergency Services Authority (FESA) and has a service agreement. FESA provides backup to CSBP personnel in emergency response situations and regularly visits the CSBP industrial complex for training and familiarisation purposes. On-site emergency facilities at CSBP’s Kwinana works will continue to include a dedicated emergency response vehicle, fire tender and a patient transfer vehicle at all times, and an occupational health nurse during normal working hours. The emergency response vehicles and resources will be available to service any off-site incident.</td>
<td>The changes proposed as a part of the Ammonium Nitrate Production Facility expansion reduce the cumulative risk profile for the Kwinana industrial complex. This is due to the proposed reduction in size and eastward relocation of the ammonium nitrate solution storage tank. This action prevents any ammonium nitrate solution storage tank explosions damaging the refrigerated ammonia storage tanks and causing subsequent ammonia releases, hence reducing the risk profile for the whole industrial complex.</td>
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<td>Risk</td>
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<td>To ensure that risk from the proposal is as low as reasonably achievable and complies with acceptable standards and EPA criteria including Guidelines and Criteria for EIA No. 2, Guidance for Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant (EPA, 2000).</td>
<td>The existing QRA studies show that risk profiles for the Ammonium Nitrate Production Facility are within the EPA guidelines. The one exception to this is the historical exceedance onto the BP refinery land to the west of the CSBP’s industrial complex, created by the very close alignment of some facilities previously owned by BP to the remaining BP landholdings. CSBP has addressed this to an extent through leasing some land from BP for a wetland and is in the process of creating an agreement with BP for training their limited number of staff who work in the area subject to elevated risk levels. As part of this proposal, the existing 900 tonne high strength (90%) ammonium nitrate liquid tank is being transformed to a 70% ammonium nitrate liquid tank (for fertiliser manufacture), and this in turn will significantly reduce the “knock on” potential of any incidents, and hence the modelled risk of the facilities. The 900 tonne ammonium nitrate liquid tank is to be replaced by a 310 tonne (approx.) tank; the design of which will include all contemporary safety factors. CSBP have had Qest Consulting revise the previous QRA of the current Ammonium Nitrate Production Facility using updated tools and minimize methods. The updated model shows that the Ammonium Nitrate Production Facility complies with the EPA risk criteria and exhibits a slightly reduced risk profile when compared to the previous model. The reasons for this are detailed in the Kwinana Works Total Site Quantitative Risk Assessment, which for security reasons, is not included in this PER. On the Ammonium Nitrate Production Facility, the main risk contributors are release gases from streams containing ammonia or mixed nitrous oxides. The one explosion event that has offsite effects (the explosion of the ammonium nitrate solution storage tank) only generated low levels of risk. These results demonstrate that the risks exhibited by the current Ammonium Nitrate Production Facility, considered on its own, lie within the tolerable As Low As Reasonably Practicable (ALARP) region according to the EPA criteria. It should be noted that the EPA criteria refer to cumulative risk.</td>
<td>Safety features already incorporated into the existing Ammonium Nitrate Production Facility will be incorporated into any new facilities. All plant operators and maintenance employees will be trained in the safe work practices and emergency procedures appropriate to the operation of the plant and handling of all associated materials. Prior to commissioning the operating manual and procedures covering all process work, including start-up, and shut-down, plant testing, maintenance, inspection and emergency action will be updated. The potential hazards identified will be reviewed and appropriate contingency measures incorporated into existing on-site and off-site emergency procedures for the Kwinana works. CSBP maintains a close working relationship with the Fire &amp; Emergency Services Authority (FESA) and has a service agreement. FESA provides backup to CSBP personnel in emergency response situations and regularly visits the CSBP industrial complex for training and familiarisation purposes. On-site emergency facilities at CSBP’s Kwinana works will continue to include a dedicated emergency response vehicle, fire tender and a patient transfer vehicle at all times, and an occupational health nurse during normal working hours. The emergency response vehicles and resources will be available to service any off-site incident.</td>
<td>The changes proposed as a part of the Ammonium Nitrate Production Facility expansion reduce the cumulative risk profile for the Kwinana industrial complex. This is due to the proposed reduction in size and eastward relocation of the ammonium nitrate solution storage tank. This action prevents any ammonium nitrate solution storage tank explosions damaging the refrigerated ammonia storage tanks and causing subsequent ammonia releases, hence reducing the risk profile for the whole industrial complex.</td>
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The existing QRA studies show that risk profiles for the Ammonium Nitrate Production Facility are within the EPA guidelines. The one exception to this is the historical exceedance onto the BP refinery land to the west of the CSBP’s industrial complex, created by the very close alignment of some facilities previously owned by BP to the remaining BP landholdings. CSBP has addressed this to an extent through leasing some land from BP for a wetland and is in the process of creating an agreement with BP for training their limited number of staff who work in the area subject to elevated risk levels.

As part of this proposal, the existing 900 tonne high strength (90%) ammonium nitrate liquid tank is being transformed to a 70% ammonium nitrate liquid tank (for fertiliser manufacture), and this in turn will significantly reduce the “knock on” potential of any incidents, and hence the modelled risk of the facilities. The 900 tonne ammonium nitrate liquid tank is to be replaced by a 310 tonne (approx.) tank; the design of which will include all contemporary safety factors.

CSBP have had Qest Consulting revise the previous QRA of the current Ammonium Nitrate Production Facility using updated tools and minimize methods. The updated model shows that the Ammonium Nitrate Production Facility complies with the EPA risk criteria and exhibits a slightly reduced risk profile when compared to the previous model. The reasons for this are detailed in the Kwinana Works Total Site Quantitative Risk Assessment, which for security reasons, is not included in this PER.

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<tr>
<td>Traffic and Shipping</td>
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<td>To ensure that any increases in traffic and shipping do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.</td>
<td>Both employees and movements of feedstock and manufactured products in and out of the CSBP Kwinana industrial complex generate traffic movements. A summary of the published traffic volume data from 1992 to 1999 collected by Main Roads WA for Kwinana Beach Road and Patterson Road is presented in Table 28. The Main Roads data shows that in 1998/99 there were almost 6,000 traffic movements per day at the railway crossing on Kwinana Beach Road. It is expected that there has been an increase in traffic movement on Kwinana Beach Road in the last five years and even if this increase is conservatively estimated at 10% this would mean that the current traffic movement on Kwinana Beach Road is approximately 6,600. This data has been confirmed as being representative of current traffic levels by a 3 day traffic count at the entrance of the CSBP industrial complex completed by CSBP over the period 23-25 November 2004. Based on this traffic movement count there are approximately 1,400 road traffic movements per (usual business) day from the CSBP Kwinana industrial complex at present. During periods of construction activity there are periods of increased traffic movements as a result increased workforces on the site and movements of equipment and waste to and from the CSBP industrial complex. Currently there are few shipping movements into or out of Cockburn Sound as a result of the operation of the Ammonium Nitrate Production Facility. There are approximately 8 shipping movements per year associated with the import of liquid fertiliser (Flexi-N). In the last 2 years there have been four shipping movements associated with the import or export of ammonia from the expanded ammonia business. These shipments are conducted in accordance with the requirements of an environmental approval, which allows up to nine shipments of ammonia into or out of the CSBP facility per year. The potential ongoing traffic increase resulting from this proposal are likely to be attributable to 30 light vehicles, and 10 heavy vehicles per day, which is insignificant in the context of traffic movements on Kwinana Beach Road and Patterson Road. During the construction phase, which will extend over approximately 15 months, there will be an increase of approximately 150 light vehicles, and 10 heavy vehicles per day, which again is insignificant in the context of current traffic movements on Kwinana Beach Road and Patterson Road. As a result of the implementation of this proposal there will modest overall increase of approximately 50 shipping movements per year into Cockburn Sound. The increase will be comprised as follows: • a reduction approximately 8 to 10 shipping movements (4 to 5 shipments) per year as a result of imported liquid fertiliser shipments being replaced by production at Kwinana; • a potential increase of approximately 50 shipping movements from 25 export shipments of ammonium nitrate per year (at present ammonium nitrate shipments are very infrequent); and • there will be an increase of about 10 shipping movements (5 shipments) to cater for the need for sufficient ammonia feedstock during peak production periods. These changes are not regarded as significant in the context of the overall annual average number of shipping movements in Cockburn Sound which total approximately 1,900 per year (D.A. Lord &amp; Associates, 2001, p85).</td>
<td>As there is not expected to be an environmental impact related to traffic and shipping no mitigation or management measures are proposed.</td>
<td>There will be a slight increase in the number of road traffic and shipping movements as a result of this proposal being implemented. The increases are relatively small in the context of the exiting traffic movements and are therefore not expected to adversely impact on environmental values. It is important to note that the shipments of ammonia will continue to conform to the limits imposed under previous environmental approvals.</td>
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<td>Visual Amenity and Light Overspill</td>
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<td>Ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonable practicable (EPA, 2002a).</td>
<td>The existing ammonium nitrate facility is located within the centre of the CSBP industrial complex. The premises are currently not visible from publicly accessible areas other than for the prilling tower and absorber stack. Nonetheless, a range of industries surrounds the site. A new prilling tower and stack will be a maximum 65m in height. A view-shed analysis was conducted to assess the likely visual intrusion of the expanded Ammonium Nitrate Production Facility taking into account surrounding land use and topography. Results of view-shed analyses of the “expanded Ammonium Nitrate Production Facility” and suggest that the visual impact of the expanded Facility will be minimal in the context of the surrounding land use.</td>
<td>In terms of the potential for light overspill, impacts will be minimised through strategic positioning of light poles and towers, and utilisation of directional lighting. Where any additional light sources are be installed, these will be in accordance with AS4282 for the control of light overspill. No other specific mitigation or management strategy is proposed for this factor.</td>
<td>The relatively small footprint (compared to existing industrial facilities at the CSBP industrial complex), implementation of sympathetic colour schemes together with the use of screening where possible, will ensure that the EPA’s objectives in relation to visual amenity are met.</td>
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7. STAKEHOLDER CONSULTATION

7.1 Consultation Program

Given the nature and scale of the proposed expansion, CSBP was cognisant of the need to adequately inform and consult with key stakeholders as part of the development of the proposal. Therefore CSBP has developed a community and stakeholder consultation program which is consistent with the requirements of the CSBP EMS and CSBP’s usual policies in relation to community engagement.

CSBP recognises that a high degree of stakeholder participation in the consultation process will have significant benefits including:

- better information to the community resulting in more informed decision making;
- reduction in delays due to a lack of or inaccurate information;
- avoidance of misconceptions and confusion;
- greater community ownership of the project and its overall benefits; and
- allows CSBP to accommodate community expectations in the project design where feasible.

7.2 Consultation with Decision Making Authorities

In July and August 2004, CSBP commenced consultation with the Minister for State Development, the Minister for Environment, and the Chairman of the EPA, key staff from the DoIR, and the Town of Kwinana. These initial consultations involved a briefing of the need and scope of the proposed expansion, in order to trigger discussion of key factors that require addressing in as part of the project assessment.

7.3 Stakeholder Forum

On the 29th September 2004, CSBP held a Stakeholder Forum convened for the purpose of providing the community and other stakeholders with an overview of the Ammonium Nitrate Production Facility expansion proposal and an opportunity to have input into the approval process.

CSBP publicised the Stakeholder Forum in the local community newspaper and also mailed invitations to members of the local community, focus groups, local government, industrial neighbours and other decision-making authorities.

The Stakeholder Forum was attended by a total of fourteen people with the local community, CSBP’S industrial neighbours, local government, FESA and the local media being represented.
A summary of the issues raised at this forum is provided below:

- general questions regarding the ammonium nitrate production process;
- general questions related to the approval process;
- what sort of air emissions will there be from this expansion;
- what sort of effluent discharges will there be from this expansion;
- have CSBP addressed the risk aspect of this expansion;
- have CSBP considered the noise impact of this expansion; and
- will traffic increase as a result of this expansion.

CSBP have considered and addressed all the issues raised at the Stakeholder Forum in the relevant section of this PER document.

7.4 Rockingham IP14 Advisory Community

On the 3rd November 2004, CSBP presented an overview of the proposed expansion to the Rockingham IP14 Advisory Committee representing local government and several local stakeholders.

This forum raised the issues of particulates and effluent discharge to Cockburn Sound as issues that were of particular concern to them. CSBP has addressed these concerns in Section 6.4 and 6.7 of this document.

7.5 Kwinana Communities and Industries Forum

As part of their stakeholder consultation program CSBP intended to present an overview of the proposal to the Kwinana Communities and Industries Forum (KCIF) but when CSBP requested the presentation to be included on the KCIF agenda we were informed by the KCIF executive that as CSBP planned to hold an open Stakeholder Forum it was not necessary for them to also present at the KCIF.
8. SUMMARY OF ENVIRONMENTAL MANAGEMENT COMMITMENTS, STRATEGIES AND PROCEDURES

TABLE 30
AMMONIUM NITRATE EXPANSION PROJECT – ENVIRONMENTAL MANAGEMENT COMMITMENTS, STRATEGIES AND PROCEDURES

<table>
<thead>
<tr>
<th>NO</th>
<th>TOPIC</th>
<th>ACTIONS</th>
<th>OBJECTIVE/S</th>
<th>TIMING</th>
<th>ADVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction</td>
<td>Develop a Construction Environmental Management Plan for the construction phase of the expansion. The issues addressed in the Construction Environmental Management Plan will include but not be limited to: • construction noise; • construction dust; • construction waste; and • transport of infrastructure.</td>
<td>To ensure all aspects of project construction are conducted such that environmental impacts are minimised as far as practicable, and that regulatory requirements are complied with.</td>
<td>The Construction Environmental Management Plan will be submitted to the Department of Environment for approval prior to the commencement of construction.</td>
<td>DoE</td>
</tr>
<tr>
<td>2</td>
<td>Construction</td>
<td>Will implement the Construction Environmental Management Plan referred to in commitment 1 throughout the construction period of the expansion.</td>
<td>To ensure all aspects of project construction are conducted such that environmental impacts are minimised as far as practicable, and that regulatory requirements are complied with.</td>
<td>At commencement of construction.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Environmental Management</td>
<td>Update the CSBP Environmental Management System and related Procedures, which details procedures for the management and monitoring of the ammonium nitrate production facility.</td>
<td>To protect the environment in the event of an incident.</td>
<td>Prior to commissioning.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Environmental Management</td>
<td>Continue to implement the updated CSBP Environmental Management System and related Procedures referred to in commitment 3, which details procedures for the management and monitoring of the ammonium nitrate production facility.</td>
<td>To protect the environment in the event of an incident.</td>
<td>Already implemented.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Air Quality – Oxides of Nitrogen</td>
<td>Will update the Environmental Management Procedure: Continuous NOx Monitoring on the Nitric Acid Plant Procedure.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of oxides of nitrogen emissions to the atmosphere.</td>
<td>Update prior to commissioning.</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>TOPIC</td>
<td>ACTIONS</td>
<td>OBJECTIVE/S</td>
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</tr>
<tr>
<td>6</td>
<td>Air Quality – Oxides of Nitrogen</td>
<td>Will continue to implement the Environmental Management Procedure: Continuous NOx Monitoring on the Nitric Acid Plant Procedure.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of oxides of nitrogen emissions to the atmosphere.</td>
<td>Already implemented for existing plant included in design requests for proposed plant.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Air Quality – Oxides of Nitrogen</td>
<td>The proposed nitric acid plant will include world standard technology for controlling NOx emissions to levels comparable or better than the existing plant.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of oxides of nitrogen emissions to the atmosphere.</td>
<td>At commissioning.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Air Quality – Particulate</td>
<td>Will design and construct the new prilling plant to meet the emissions values specified in the PER.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of particulate emissions to the atmosphere and Cockburn Sound.</td>
<td>Prior to construction.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Air Quality – Particulate</td>
<td>If the existing prilling tower is to be operated beyond the commissioning period for the new plant (up to 12 months) then CSBP will fit appropriate scrubbing and emission control equipment to the existing prilling plant to ensure the emissions values specified in the PER are met.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of particulate emissions to the atmosphere and Cockburn Sound.</td>
<td>Twelve months from the successful commissioning of the new prilling tower.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Air Quality – Particulate</td>
<td>Whether one prilling plant or two are being operated the total emissions levels determined as meeting ambient standards will be met.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of particulate emissions to the atmosphere and Cockburn Sound.</td>
<td>Twelve months from the successful commissioning of the new prilling tower.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Air Quality – Ammonia</td>
<td>Will monitor ammonia emissions from the existing and new prilling tower in accord with standards and techniques required by the Environmental Protection Licence.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of ammonia emissions to the atmosphere.</td>
<td>As specified in the Environmental Protection Licence.</td>
<td>DoE</td>
</tr>
<tr>
<td>12</td>
<td>Air Quality – Ammonia</td>
<td>Will report the results of the ammonia monitoring as required by the Environmental Protection Licence.</td>
<td>To ensure that best practicable measures are taken to minimise discharges of ammonia emissions to the atmosphere.</td>
<td>As specified in the Environmental Protection Licence.</td>
<td>DoE</td>
</tr>
<tr>
<td>NO</td>
<td>TOPIC</td>
<td>ACTIONS</td>
<td>OBJECTIVE/S</td>
<td>TIMING</td>
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</tr>
<tr>
<td>13</td>
<td>Greenhouse Gases</td>
<td>Will closely monitor the commercial trials of new ‘low $\text{N}_2\text{O}$ emission’ catalysts for nitric acid plants and will adopt the new catalyst technology once it has been proven to be feasible in the setting of plant operating on a commercial basis.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>When proven to be feasible in the setting of plant competing on a commercial basis. The new plant will be designed to accept these new technologies.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Greenhouse Gases</td>
<td>The new nitric acid plant will be designed to operate with these potential ‘low $\text{N}_2\text{O}$ emission’ catalyst technologies.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>Prior to construction.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Greenhouse Gases</td>
<td>Will submit a report to the EPA reviewing the current state of testing of low $\text{N}_2\text{O}$ emission catalysts.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>3 months prior to commissioning of the new ammonium nitrate facility.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Greenhouse Gases</td>
<td>Will submit to the EPA an update of the report reviewing the current state of testing of low $\text{N}_2\text{O}$ emission catalysts.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>Every 2 years after commissioning until the new technology is adopted or the EPA advises that the report is no longer required.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Greenhouse Gases</td>
<td>CSBP will design and construct the new nitric acid plant with a larger boiler than is currently in the existing nitric acid plant, which will in turn is expected to reduce $\text{CO}_2$-e generation (from $\text{N}_2\text{O}$) by approximately 68,000 tpa when compared to the existing nitric acid plant.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>Prior to design and construction.</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>TOPIC</td>
<td>ACTIONS</td>
<td>OBJECTIVE/S</td>
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</tr>
<tr>
<td>18</td>
<td>Greenhouse Gases</td>
<td>Will retrofit a larger boiler to the existing nitric acid plant.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>If the technology proves commercially successful in the new plant, and after any Australian greenhouse gas emission laws and related carbon trading schemes are known (CSBP does not wish to be penalised for early action in this regard and recognises the EPA’s view that the EPA can not commit beyond Western Australian laws).</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Greenhouse Gases</td>
<td>Will retrofit N₂O reduction technologies in the existing nitric acid plant.</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>If the technology proves commercially successful in the new plant, and after any Australian greenhouse gas emission laws and related carbon trading schemes are known (CSBP does not wish to be penalised for early action in this regard and recognises the EPA’s view that the EPA can not commit beyond Western Australian laws).</td>
<td></td>
</tr>
<tr>
<td>NO</td>
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</tr>
<tr>
<td>20</td>
<td>Greenhouse Gases</td>
<td>Subject to the satisfactory contractual arrangement (that should be in place by June 2005) CSBP will provide up to 80,000 tpa of CO₂ to Alcoa World Alumina Australia for injection into residue disposal areas to create carbonates to bind the CO₂</td>
<td>To ensure that best practicable measures and technologies are used to minimise Western Australia’s greenhouse gas emissions.</td>
<td>Subject to the satisfactory contractual arrangement.</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Surface water</td>
<td>Will maintain nitrogen emissions in effluent at a level no higher than the 3 month rolling average to June 2004.</td>
<td>To manage the potential effects of the proposal on surface water quality.</td>
<td>After commissioning.</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Surface water</td>
<td>Will maintain its commitment to dispose of effluent to the Sepia Depression (and CSBP has a contract with WAWC).</td>
<td>To manage the potential effects of the proposal on surface water quality.</td>
<td>When the WAWC ocean outfall pipeline is available for use.</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Surface water</td>
<td>Will review the performance of its pilot nitrogen stripping wetland, and determine whether to proceed with the planned 3 additional wetland cells.</td>
<td>To manage the potential effects of the proposal on surface water quality.</td>
<td>February 2006.</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Surface water</td>
<td>Will continue, through KIC, to contribute to the State’s ambient monitoring of Cockburn Sound waters.</td>
<td>To manage the potential effects of the proposal on surface water quality.</td>
<td>Ongoing.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Solid Waste</td>
<td>Review and update the Solid Waste Management Plan, which details procedures for the management of solid waste disposal from the industrial complex. This plan will include but not be limited to:</td>
<td>To ensure that waste is relocated to the correct locations to minimise potential contamination to the receiving environment.</td>
<td>Already implemented.</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Solid Waste</td>
<td>Continue to implement the Solid Waste Management Plan referred to in commitment 25.</td>
<td>To ensure that waste is relocated to the correct locations to minimise potential contamination to the receiving environment.</td>
<td>Every 3 years or as required by the Document Management System.</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>TOPIC</td>
<td>ACTIONS</td>
<td>OBJECTIVE/S</td>
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<tr>
<td>27</td>
<td>Noise Management</td>
<td>Will design, construct and operate the plants to ensure that Environmental Protection (Noise) Regulations 1997 noise limits are met at residential premises to the extent CSBP’s operations contribute to the noise levels. CSBP will construct a noise barrier or similar on the northern site boundary.</td>
<td>To ensure compliance with prescribed standards and minimise where practicable noise impacts.</td>
<td>At design and during operation.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Noise Management</td>
<td>Will monitor the plants for compliance with the industry to industry noise limits in the Environmental Protection (Noise) Regulations 1997, as they are currently planned to be amended.</td>
<td>To ensure compliance with prescribed standards and minimise where practicable noise impacts.</td>
<td>In the event the Regulations for this industry to industry noise level are not amended, CSBP will comply with the existing Regulations within 6 months of the Regulation review process ceasing.</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Water Resources</td>
<td>Will source water for this project from either KWRP, or sustainable ground water supplies under licence.</td>
<td>To ensure use of scheme water is minimized.</td>
<td>At commissioning.</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Water Resources</td>
<td>WA Water Corporation scheme water will not be used except in emergency or supply disruption situations.</td>
<td>To ensure use of scheme water is minimized.</td>
<td>At commissioning.</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Water Resources</td>
<td>Will continue internal programs directed at increasing water use efficiency, and source protection.</td>
<td>To ensure use of scheme water is minimized.</td>
<td>Ongoing.</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Facility Emergency Response</td>
<td>Maintain a Safety Report as described under the National Standard “Control of Major Hazard Facilities”, as required by the facility’s Dangerous Goods Licence or other relevant legislation.</td>
<td>To provide the framework to ensure that the facility emergency response is appropriate to respond to all scenarios.</td>
<td>Already implemented. DoIR</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Environmental Risk</td>
<td>Will relocate and decrease the size of the high strength ammonium nitrate solutions tank.</td>
<td>To reduce off site risk potential.</td>
<td>At construction.</td>
<td>DoIR</td>
</tr>
<tr>
<td>34</td>
<td>Shipping</td>
<td>Will limit the number of shipments of ammonia to a maximum of 9 shipments per year.</td>
<td></td>
<td>Ongoing.</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Shipping</td>
<td>Will limit potential ammonium nitrate exports to no more than 25 ships each up to 4,000 tonnes per ship.</td>
<td></td>
<td>Ongoing.</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>TOPIC</td>
<td>ACTIONS</td>
<td>OBJECTIVE/S</td>
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<tr>
<td>36</td>
<td>Visual Amenity</td>
<td>Will undertake the following management strategies where appropriate:</td>
<td>To improve the visual amenity of the proposed expansion</td>
<td>At construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• buildings will be coloured in accordance with CSBP’s usual standards</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>for industrial plant;</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• good housekeeping practices will be maintained at all times; and</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• lighting will comply with Australian Standard AS 4282.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. REFERENCES


(EFMA) European Fertilizer Manufacturing Association (2000b) *Best Available Techniques for Pollution Prevention and Control in the European Fertilizer


(EPA) Environmental Protection Authority (2004c) Use of Cape Peron Outlet Pipeline to Dispose of Industrial Wastewater, Kwinana, Bulletin 1135. Perth, Western Australia.


(Water Corporation) Water Corporation of Western Australia (2003) *Use of Cape Peron Outlet Pipeline to Dispose of Industrial Wastewater to Sepia Depression, Kwinana*, Western Australia, November 2003.


10. GLOSSARY

10.1 Abbreviations

- ACGIH: American Conference of Government Industrial Hygienists
- AGO: Australian Greenhouse Office
- AGR: Australian Gold Reagents
- Ansol: Ammonium nitrate solution
- ANZECC: Australian and New Zealand Environment and Conservation Council
- ARMCANZ: Agricultural and Resource Management Council of Australia and New Zealand
- CO₂: Carbon dioxide
- COAG: Council of Australian Governments
- CSBP: CSBP Limited
- DEP: Department of Environmental Protection (now known as DoE)
- DNAP: Dyno Nobel Asia Pacific
- DoE: Department of Environment
- DNV: Det Norske Veritas
- DoIR: Department of Industry and Resources
- EMS: Environmental Management System
- EPA: Environmental Protection Authority
- FESA: Fire and Emergency Services Authority
- HNO₃: Nitric acid
- ISO: International Organization for Standardization
- KCIF: Kwinana Communities & Industries Forum
- KIA: Kwinana Industrial Area
- KIC: Kwinana Industries Council
- KIEP: Kwinana Industries Education Partnership
- KIMA: Kwinana Industries Mutual Aid
- KIPS: Kwinana Industries Public Safety
- KWRP: Kwinana Water Reclamation Plant
- Lₐ₁: A Lₐ₁ level is an A-weighted noise level, which is exceeded for 1% of the representative assessment period. (An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. As the human ear is not very sensitive in the lower frequencies these frequencies are weighted more than the higher frequencies. An A-weighted sound pressure level is described by the symbol dB(A)).
- Lₐ₁₀: A Lₐ₁₀ level is an A-weighted noise level, which is exceeded for 10% of the representative assessment period. A Lₐ₁₀ level is considered to represent the “intrusive” noise level.
- Lₐₘₐₓ: A Lₐₘₐₓ level is the maximum A-weighted noise level during the representative assessment period.
- NSESD: National Strategy for Ecologically Sustainable Development
- N₂O: Nitrous oxide
- NH₃: Ammonia
- NH₄NO₃: Ammonium nitrate
10.2 Units

°C degrees Celsius (Centigrade)
d day
dB decibels
dB(A) decibels (A-weighted)
g grams
g/m³ grams per cubic metre
g/Nm³ grams per normal cubic metre
g/s grams per second
kg kilograms
kg/d kilograms per day
kg/h kilograms per hour
kg/y kilogram per year
km kilometres
Kpa Kilo pascals
m metres
m/day metres per day
m/s metres per second
m² square metres
m³ cubic metres
m³/s cubic metres per second
mg milligrams
mg/m³ milligrams per cubic metre
mg/Nm³ milligrams per normalised cubic metre
Nm³ normalised cubic metres (measured at 0°C and 101.3kPa)
ppm parts per million
s seconds
t tonnes
tpa tonnes per annum
tpd tonnes per day
µg/m³ micrograms per cubic metre
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>w/w</td>
<td>weight per unit weight</td>
</tr>
<tr>
<td>y</td>
<td>year</td>
</tr>
</tbody>
</table>
FIGURES
AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION PROJECT
PUBLIC ENVIRONMENTAL REVIEW
LOCATION OF NEW INFRASTRUCTURE ENVELOPE WITHIN THE CSBP INDUSTRIAL COMPLEX

PILOT CONSTRUCTED WETLAND
WESTERN TRANSIT STORE
EXPANSION ENVELOPE
ENTRANCE TO CSBP INDUSTRIAL COMPLEX

SOURCE: Wesfarmers CSBP Ltd, May 2002
AMMONIUM NITRATE PRODUCTION

1. Nitric Acid Plant

2. Ammonium Nitrate Solution Plant

3. Prilling Plant

4. Storage

5. Bulk Road Despatch

- Air
- Natural Gas
- Imported Ammonia
- Power from Recovered Heat
- Water

Producing:

- Ammonia
- Ammonia Solution
- Ammonium Nitrate
- Ammonium Nitrate Solution
- Ammonium Nitrate Prill

Uses:

- Bulk Road Despatch
- Liquid Fertilisers

Source: Wesfarmers CSBP Ltd, 2002
AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION PROJECT
PUBLIC ENVIRONMENTAL REVIEW
KWINANA INDUSTRIAL AREA BUFFER ZONE

FIGURE 5

Legend
- Local Government Boundary
- Area A - Industrial Region
- Area B - Buffer Region
- Area C - Rural and Residential Region

CSBP Industrial Complex

AERIAL SOURCE: StreetExpress 2000, DOLA.
**AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION PROJECT**

**PUBLIC ENVIRONMENTAL REVIEW**

**FIGURE 6**

*Environmental scientists*

**VISUAL IMPACT ASSESSMENT PHOTOGRAPH LOCATIONS**

- Junction of Patterson Road & Old Mandurah Road (Refer Plate 1)
- High Point Along Wellard Road (Refer Plate 2)
- Grain Terminal
- Rockingham Beach Road (Refer Plate 3)

**LEGEND**

- Photograph Location & Direction

**SCALE 1 : 30 000**

**AERIAL SOURCE: StreetExpress 2000, DOLA**
Existing View

Modelled View

AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION PROJECT
PUBLIC ENVIRONMENTAL REVIEW

VIEW FROM JUNCTION OF PATTERSON AND OLD MANDURAH ROADS

PLATE 1
AMMONIUM NITRATE PRODUCTION FACILITY EXPANSION PROJECT
PUBLIC ENVIRONMENTAL REVIEW

VIEW FROM HIGH POINT ALONG WELLARD ROAD

PLATE 2
APPENDICES
APPENDIX 1

ENVIRONMENTAL PROTECTION LICENCE
6107/13
WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENT
Environmental Protection Act 1986

LICENCE

LICENCE NUMBER: 6107/13

NAME OF OCCUPIER:
CSBP Limited

ADDRESS OF OCCUPIER:
PO Box 345
Kwinana WA 6167

NAME AND LOCATION OF PREMISES:
CSBP Limited
Kwinana Beach Road
Kwinana Beach WA 6167

Environmental Protection Regulations 1987
CLASSIFICATION(S) OF PREMISES:
Category 31 - Chemical Manufacturing

COMMENCEMENT DATE OF LICENCE: Saturday, 31 July 2004

EXPIRY DATE OF LICENCE: Saturday, 30 July 2005

CONDITIONS OF LICENCE:
As described and attached:

DEFINITIONS
GENERAL CONDITION(S) (5)
WATER POLLUTION CONTROL CONDITION(S) (1)
MARINE POLLUTION CONTROL CONDITION(S) (7)
AIR POLLUTION CONTROL CONDITION(S) (8)
ATTACHMENTS (2)

[Signatures]
Officer delegated under Section 20
of the Environmental Protection Act 1986

Date of Issue: Wednesday, 21 July 2004
PREAMBLE

The following statements in this Preamble either reflect important sections of the Environment Act 1986 or provide relevant background information for the licensee. They should not be regarded as conditions of licence.

Applicability

This licence is issued to CSBP Limited (CSBP) for chemical import and export and manufacturing operations undertaken at Kwinana Beach Road, Kwinana Beach, which is a prescribed premises within Schedule 1 of the Environmental Protection Regulations, and includes but is not necessarily limited to, the following operations:

- use of the Bulk Cargo Jetty for transporting solid and liquid materials
- fertilizers, chemicals and raw materials storage and distribution facilities
- Superphosphate Manufacturing Plant
- liquid fertilizer mixing
- Granulation Plant
- Chlor-Alkali Manufacturing Plant
- Ammonia manufacturing Plant
- Integrated Ammonium Nitrate - Nitric Acid Plant operations
- Ammonium Nitrate Prilling Plant
- wastewater collection, treatment and disposal system
- nitrogen-stripping wetland
- arsenic-plume treatment plant

This facility is prescribed within Schedule 1 of the Environmental Protection Regulations 1987 as outlined in Table 1.

Table 1: Categories under which CSBP is prescribed.

<table>
<thead>
<tr>
<th>Category Number</th>
<th>Category Name</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>31</td>
<td>Chemical Manufacturing</td>
<td>Other than Cat 32, on which chemical products are manufactured by a chemical process.</td>
</tr>
<tr>
<td>61</td>
<td>Liquid waste facility</td>
<td>Premises on which liquid waste produced on other premises (other than sewage waste) is stored, reprocessed, treated or irrigated.</td>
</tr>
<tr>
<td>61A</td>
<td>Solid waste facility</td>
<td>Premises (other than Cat 67) on which solid waste produced on other premises is stored, reprocessed, treated or discharged onto land.</td>
</tr>
</tbody>
</table>

Reporting requirements

Table 2 below provides a summary of reporting requirements
Table 2: Reporting schedule

<table>
<thead>
<tr>
<th>Condition</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting deadline</td>
<td>Six Monthly</td>
</tr>
<tr>
<td>W1(d) Groundwater</td>
<td>One calendar month</td>
</tr>
<tr>
<td>Annual groundwater report</td>
<td>Two calendar months</td>
</tr>
<tr>
<td>M4(b) Cockburn Sound Discharge</td>
<td>Emergency beach outfall discharges</td>
</tr>
<tr>
<td>M5 Cockburn Sound Discharge</td>
<td>Daily wastewater analysis</td>
</tr>
<tr>
<td>Daily discharges averaged for each month</td>
<td></td>
</tr>
<tr>
<td>A2(b) Ammonium nitrate and nitric acid plant</td>
<td>Continuous hourly average NOx discharge</td>
</tr>
<tr>
<td>A4 Prilling Plant</td>
<td>6 Monthly and monthly particulate grab samples</td>
</tr>
<tr>
<td>A5 Chlor Alkali Plant</td>
<td>Summary of chlorine alarm incident reports</td>
</tr>
<tr>
<td>A6(b) Super Phosphate Manufacturing Plant</td>
<td>Monthly fluoride grab samples</td>
</tr>
<tr>
<td>A7(b) Granulation Plant</td>
<td>Monthly ammonia and fluoride grab samples</td>
</tr>
<tr>
<td>A8(b) 2000 Ammonia Plant</td>
<td>Monthly NOx grab samples</td>
</tr>
</tbody>
</table>

Non-Standard Operations

The licensee should inform the Director, at least 24 hours prior to the commencement of any planned non-standard operation that may have the potential to cause pollution.

Emergency, Accident or Malfunction

The licensee should inform the Director during office hours or the DoE out-of-hours number as soon as is practically possible of the identification of any discharge of waste which has occurred as a result of an emergency, accident or malfunction, or extreme weather conditions, otherwise than in accordance with any condition of this Licence and has caused or is likely to cause pollution.

Alteration to Premises

Prior to making any significant alterations to the premises which may affect the air, water or noise emissions from the premises the licensee must submit a proposal to the Director accompanied by supporting information and plans which allow the environmental impact of that change to be assessed.

CONDITIONS OF LICENCE

DEFINITIONS

In these Conditions of Licence, unless inconsistent with the text or subject matter:
“annually” means a 12 calendar month period, commencing on the licence renewal date;

“approved” means approval in writing;

“DoE” means Department of Environment;

“Director” means Director, Environmental Management Division, or other delegated officer, of the Department of Environment for and on behalf of the Chief Executive Officer as delegated under Section 20 of the Environmental Protection Act 1986;

“Director” for the purpose of notifications and correspondence means:

The Regional Manager
Kwinana Peel Region
Department of Environment
PO Box 454
KWINANA WA 6966

Telephone 9411 1777
Facsimile 9419 5897
After Hours 1800 018 800

“g/m³” means grams per cubic metre, expressed at 0 degrees Celsius and 1.0 atmosphere pressure (101.325 kilopascals);

“g/s” means grams per second;

“kg/day” means kilograms per day;

“KWRP pipeline” means the Water Corporation operated Kwinana Water Reclamation Plant pipeline for supply of reclaimed water to industry;

“licensee” means CSBP Limited;

“licensed premises” means the operations undertaken by CSBP Limited within the premises described by the Certificate of Title as Kwinana Lots 205, 206, 208 and portion of each of Kwinana Lots 207, 209 and Cockburn Sound Locations 244 and 704; the whole of the said land being Lot 20 the subject of Diagram 78086.

“m/s” means metres per second

“MDEA” means methyldiethanolamine;

“NOx concentration” means the total combined concentration of nitric oxide and nitrogen dioxide, expressed as nitrogen dioxide, dry, at 0 degrees Celsius and 1.0 atmosphere pressure (101.325 kilopascals);

“QAP” means quality assurance (QA) programme; in this case, a document that provides an index of the whereabouts of the various records, documents and systems that contain information relating to the QA of the data as required by the various conditions within the licence;

“reasonably practicable” means the ability to notify and report, taking into consideration:
- immediate actions required by the licensee to minimise risk to human health and safety, and adverse environmental impacts,
• the technical complexity of the circumstances and the time required to identify relevant information for reporting purposes,
• staffing arrangements at the time in relation to normal business hours;

"reliable data" means data which meets approved acceptable quality criteria, verified by approved calibration procedures and detailed in the Quality Assurance Programme;

"reportable threshold" means three fourths of any concentration limit, mass load limit or other limit specified in these conditions of licence M6, A4(c), A5(ii), A6(c), A7(c).

"start up" with reference to the integrated Ammonium Nitrate - Nitric Acid Plant means from when the reactors are 'lit-off' to when ammonia is introduced to the Selective Catalytic Reductor (SCR);

"SDOOL" means the Water Corporation operated Sepia Depression Ocean Outfall Line;

"six-monthly reporting period" means a six calendar month period commencing on the licence renewal day and a day six calendar months beyond the licence renewal day;

"usual business day" means Monday to Friday excluding public holidays.

Other terms take their meaning as defined in the Environmental Protection Act 1986.

GENERAL CONDITIONS

REPORTING FORMAT

G1(a) Any continuous atmospheric discharge data submitted by the licensee in accordance with the conditions of this licence shall be computer readable and shall be:

(i) in time-series hourly averaged listings; and
(ii) the time mark in hourly-averaged continuous data shall refer to the data collected in the hour prior to the time mark.

G1(b) The licensee shall include with submitted data, relevant reportable thresholds and discharge limits associated with each substance that is required to be monitored by a condition of this licence.

G1(c) The licensee shall, for the practical purposes of reporting monitoring results, not be required to wait for analytical results that have a long turn-around time. In such cases the licensee should annotate a report to the effect that certain results will be provided in the next sequential report.

SIX-MONTHLY REPORTING

G2(a) The licensee shall provide to the Director, a six-monthly monitoring report pursuant to:
(i) Condition M4 should the emergency wastewater discharges to Cockburn Sound via the Beach outfall occur;

(ii) Condition M5(c) and M6(b) for monitoring wastewater discharges to Cockburn Sound;

(iii) Condition M5(c) and M6(b) for monitoring wastewater discharges to SDOOL; and

(iv) Condition A2(b) for continuous monitoring of nitrogen oxide emissions.

G2(b) The data required by part (a) of this condition shall be provided no later than one calendar month after the last day of the period to which the data relates or within such longer period of time as is approved by the Director

ANNUAL REPORTING

G3(a) The licensee shall provide to the Director, an annual monitoring report pursuant to:

(i) Condition G5(c) for updated information for the Quality Assurance Program;

(ii) Conditions M5 and M6 providing averaged wastewater data for each month in the reporting period;

(iii) condition W1(d) for the annual groundwater monitoring report;

(v) Condition A4 for particulate grab-sample measurements for the Prilling Plant;

(iv) Condition A5 for a summary of incident reports of ammonia releases for the Chlor-Alkali Plant;

(v) Condition A6(a) and (b) for a summary of monthly and annual hydrofluoric acid data for the Superphosphate and Granulation Plants;

(vi) Condition A7(b) for a summary of monthly ammonia grab sample analysis for the Granulation Plant;

(vii) Condition A8(b) for a summary of monthly NOx grab samples for the Ammonia Plant;

G3(b) The data required by part (a) of this condition shall be provided no later than two calendar months after the last day of the period to which the data relates or within such longer period of time as is approved by the Director

DISCHARGES IN EXCESS OF REPORTABLE THRESHOLD OR LIMIT

G4(a) The licensee shall notify the Director before 5pm on the next usual business day after becoming aware that any monitoring result has exceeded a reportable threshold for a waste discharge specified in any condition of this licence.

G4(b) The licensee shall provide a non-conformance report to the Director where any monitoring results are in excess of the limits specified in any condition of this Licence within seven usual business days of that exceedance becoming known. The exceedance report shall contain:

(i) the amount by which the limit was exceeded, supported by relevant monitoring data;

(ii) reasons for the emission levels being in excess of the limits; and
(iii) an outline of corrective action taken by the licensee to ensure that emission levels are maintained below the limits, where applicable.

G4(c) The licensee shall provide a detailed report to the Director of the outcome of internal investigations by the licensee where any exceedance, so determined by the Director, warrants further investigation, within a time period so determined by the Director.

G4(d) The licensee shall provide a brief summary of any exceedances of licence conditions, occurring during the reporting period to be included in the annual report required by Condition G3

QUALITY ASSURANCE PROGRAMME

G5(a) The licensee shall maintain a current Quality Assurance Program which describes in detail the sampling methodology, calibration, instrumentation and calculation procedures implemented to satisfy any monitoring requirement contained in the conditions of this licence. The Quality Assurance Program may refer to other published methods.

G5(b) The Quality Assurance Program shall ensure that all monitoring equipment, required by any licence condition, is calibrated in accordance with the manufacturer's requirements or an appropriate Australian, International or appropriate standard of another country.

G5(c) The Quality Assurance Program, referred to in part (a) of this conditions, shall be amended to reflect any alterations or additions to the calibration, instrumentation and calculation procedures being adopted in practice by the licensee within three months of that change occurring.

G5(d) The licensee shall provide the Director with an updated tabulated list of all QAPs required for accurate reporting pursuant to conditions of this licence, the condition to which they relate and the most recent revision date in each annual report.

GROUNDWATER PROTECTION CONDITIONS

GROUNDWATER MONITORING PROGRAM

W1(a) The licensee shall have in place a groundwater monitoring programme that characterises the chemical and physical properties of the superficial aquifer groundwater beneath CSBP premises and quantifies the impacts and influences on groundwater from the operations on the premises.

W1(b) All water samples, required by conditions of this licence, shall be taken, preserved, transported and analysed (where appropriate) in accordance with AS 5667.1:1998 and also in accordance with supplementary standards recommended by AS 5667.1:1998 for taking samples in different situations, or as approved by the Director, as part of the Quality Assurance Program.

W1(c) The licensee shall also conduct groundwater monitoring in accordance with the operating strategy as approved by the Water and Rivers Commission 9 September 2002, in the annual groundwater report of 31 January 2003. This programme may be
varied from time to time in accordance with the written instructions from the Director.

W1(d) The licensee shall prepare an annual groundwater monitoring report, in accordance with the requirements of part (C) of this condition, to indicate contours calculated from measurements and samples taken from all available monitoring bores within the premises and shall include data required by part (c) of this condition.

W1(e) The licensee shall contain and recover, or absorb and dispose of, liquid resulting from spills or leaks of chemicals including fuel, oil or other hydrocarbons, whether inside or outside secondary containment compound(s) in accordance with Quality Assurance Procedures.

W1(f) Groundwater abstracted and treated in the Arsenic-Groundwater-Plume Treatment Plant, shall be discharged by the licensee to a surface infiltration drain.

MARINE POLLUTION CONTROL CONDITIONS

CONVEYOR HOUSE KEEPING AND MAINTENANCE

M1 The licensee shall maintain conveyors, shedding plates and transfer stations on the Bulk Cargo Jetty under the control of the licensee, in a manner which prevents or minimises contamination of the marine environment.

STOCKPILE MANAGEMENT

M2 The licensee shall at all times, as approved from time to time by the Director, store raw materials and fertilisers (except phosphate rock, salt and sulfur) upon a sealed hard-stand and under a rain-proof covering.

MARINE DISCHARGES

M3(a) All process wastewater shall only be discharged to the environment via the:

(i) diffuser at the end of the sub-marine pipeline to Cockburn Sound,
(ii) Water Corporation SDOOL pipeline;
(iii) emergency beach outfall to Cockburn Sound.

M3(b) The licensee shall notify the Director of any intention to discharge wastewater other than stormwater via the beach outfall, as per part (a) iii of this condition.

MONITORING PROGRAMME FOR EMERGENCY MARINE DISCHARGES

M4 The licensee shall, in the event of a discharge via the beach outfall, conduct the following monitoring program in order to estimate the mass load and concentration of substances entering Cockburn Sound via the beach outfall:

(i) representative samples shall be taken of the discharge;
(ii) determine the parameters as specified in Condition M5(c); and
(iii) a record of start and stop times of wastewater discharge via the beach outfall shall be kept.
MONITORING PROGRAMME FOR DISCHARGE VIA THE SUBMARINE PIPELINE or TO THE WATER CORPORATION KWRP PIPELINE

M5(a) The licensee shall collect a continuous sample from the effluent stream, that is discharged in accordance with Condition M3(a) i or ii, where the continuous sample is bulked to form a representative sample of the effluent discharged for each day.

M5(b) The licensee shall determine the discharge of the effluent stream, as required by Condition M3(a) i or ii, in cubic metres per day, on a daily basis.

M5(c) The licensee shall determine the pH and concentration of substances listed in the paragraph below, for each sample bulked on a daily basis, as required by part (a) of this condition, adjusted for inflows pursuant to part (d) of this condition. For this purpose, total inorganic nitrogen is defined as the combination of ammonium ion nitrogen (NH₄⁺) and nitrate nitrogen (NO₃⁻).

Total Inorganic Nitrogen, Orthophosphate, Aluminium, Arsenic (inorganic), Cadmium, Chromium, Cobalt, Copper, Free Cyanide, Fluoride, Iron, Lead, Manganese, MDEA, Mercury, Molybdenum, Nickel, Vanadium, Zinc.

M5(d) The licensee shall, on a weekly basis, collect representative samples of:
(i) superficial aquifer bore water withdrawn for process water use;
(ii) sea water imported from BP Refinery (Kwinana) Pty Ltd; and
(iii) Water Corporation KWRP water withdrawn for process water use
for the purpose of determining the parameters required by part (c) of this condition for the samples collected. The concentration and load of the substances measured should be calculated for the purpose of subtraction from the total discharged from the premises in order to determine the contribution from the licensee’s activities.

CSBP NITROGEN-STRIPPING WETLAND

M6(a) The licensee shall collect a continuous sample from the wetland discharge point, where a continuous sample is bulked to form a representative sample of the effluent discharged for each batch discharge from the wetland.

M6(b) The licensee shall determine the concentration and load of MDEA and total hydrocarbons, where hydrocarbons have been introduced to the wetland from BP Refinery (Kwinana) for each batch discharge from the wetland.

DISCHARGE LIMITS

M7(a) The licensee shall ensure that the daily concentrations and monthly average daily loads, of substances in effluent discharged in accordance with Condition M3, shall not exceed the limits specified in Table 3

where:
- the limits specified by Table 3 represent above-background concentration and load limits, as calculated by subtraction of parameters determined in accordance with M5(d) from the total discharged from the premises, in order to determine the contribution from the licensee’s activities; and
total inorganic nitrogen, orthophosphate and fluoride are calculated as a three-month rolling average.

**TABLE 3 Discharge limits to Cockburn Sound or SDOOL Pipeline**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Daily concentration limit mg/L</th>
<th>Daily concentration limit mg/L</th>
<th>Monthly average daily load limit kg/day</th>
<th>Target load (Guideline) kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For 98% of time for rolling 365 days</td>
<td>For 2% of time for rolling 365 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Inorganic Nitrogen</td>
<td>-</td>
<td>-</td>
<td>200</td>
<td>750</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>750</td>
</tr>
<tr>
<td>Aluminium;</td>
<td>-</td>
<td>-</td>
<td>1.000</td>
<td>0.456</td>
</tr>
<tr>
<td>Arsenic (Inorganic)</td>
<td>0.05</td>
<td>0.1</td>
<td>0.045</td>
<td>0.015</td>
</tr>
<tr>
<td>Cadmium</td>
<td>-</td>
<td>-</td>
<td>0.137</td>
<td>0.008</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.1</td>
<td>0.1</td>
<td>0.137</td>
<td>0.003</td>
</tr>
<tr>
<td>Cobalt</td>
<td>0.05</td>
<td>0.05</td>
<td>0.240</td>
<td>0.002</td>
</tr>
<tr>
<td>Copper</td>
<td>0.285</td>
<td>0.485</td>
<td>0.240</td>
<td>0.032</td>
</tr>
<tr>
<td>Free cyanide</td>
<td>0.1</td>
<td>0.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fluoride</td>
<td>-</td>
<td>-</td>
<td>54.0</td>
<td>6.8</td>
</tr>
<tr>
<td>Tot hydrocarbon</td>
<td>-</td>
<td>-</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Iron</td>
<td>-</td>
<td>-</td>
<td>2.000</td>
<td>0.585</td>
</tr>
<tr>
<td>Lead</td>
<td>0.05</td>
<td>0.075</td>
<td>0.137</td>
<td>0.008</td>
</tr>
<tr>
<td>Manganese</td>
<td>-</td>
<td>-</td>
<td>0.240</td>
<td>0.014</td>
</tr>
<tr>
<td>Mercury</td>
<td>-</td>
<td>-</td>
<td>0.020</td>
<td>0.002</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.250</td>
<td>0.25</td>
<td>1.000</td>
<td>0.055</td>
</tr>
<tr>
<td>MDEA</td>
<td>16.0</td>
<td>16.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.125</td>
<td>0.3</td>
<td>0.240</td>
<td>0.062</td>
</tr>
<tr>
<td>Vanadium</td>
<td>0.050</td>
<td>0.06</td>
<td>0.137</td>
<td>0.006</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.25</td>
<td>2.25</td>
<td>5.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**Note**  
1. The licence recognises that there are difficulties in analysing metal species in groundwater or seawater in the micrograms per litre range. The licensee has provided to DEP a CCWA report (Investigation of Chemical Analysis of three Aqueous Matrices for Determination of Trace Metals, Chemicals Centre of WA) relating to this issue of analytical accuracy. The low mg/L concentrations considered under this condition should be interpreted with the information contained in the CCWA report on analytical accuracy.
Note 2. The concentrations in Table 3 assume a 1:200 dilution within the mixing zone above the CSBP diffuser in Cockburn Sound. Studies by K.Zic; Kellog, Brown & Root (2004) put dilutions at between 1:270 and 1:914 depending on the combination of different factors.

Note 3. For the purpose of this licence the data shall include the previous 365 days before the date of issue of the licence.

Note 4. Target loads for nitrogen and phosphorus compounds are measured daily loads; all others are monthly average daily load.

M7(b) Effluent discharged to Cockburn Sound or to the SDOOL shall at all times be between 6.0 and 9.0 pH units except for one day in the month when the pH may be between 4.0 and 10.0; unless otherwise specified or approved by the Director.

AIR POLLUTION CONTROL CONDITIONS

EMISSIONS MONITORING REQUIREMENTS

A1(a) The licensee shall ensure that waste gases shall only be emitted to the environment through the emission points shown in Attachment 1 and listed in Attachment 2.

A1(b) The licensee shall also report the following parameters when determining, for the purpose of any condition of this licence, the quantity and/or nature of waste gases discharged:

(i) density at exit temperature;
(ii) moisture content;
(iii) total volume flow rate at exit temperature;
(iv) exit temperature; and
(vi) production rate through the relevant item of equipment from which the discharge originates, percent of maximum capacity and other notable operational circumstances likely to affect discharges from the associated item.

A1(c) Where any of the parameters required by part (b) of this condition are not directly measured, then estimates derived from control room data shall be included and declared as such.

A1(d) Where continuous gaseous emission analysers are required by conditions of this licence, the licensee shall ensure that reliable emissions monitoring data is obtained and recorded for:

(i) greater than 90 percent of the manufacturing plant's stable operating time in every calendar month period; and
(ii) greater than 95 percent of the manufacturing plant's stable operating time in any 12 consecutive calendar months.

A1(e) The licensee shall for practical operational purposes and the efficiency of obtaining reliable gaseous emissions test results:
(i) periodic stack testing, required by conditions of this licence, shall be carried out only after a continuous operating period of not less than 10 days has been achieved; and

(ii) when equipment failures or other such circumstances occur, such that a gaseous emission test cannot be conducted, then the Director shall be notified and an alternative time agreed for testing.

INTEGRATED AMMONIUM NITRATE AND NITRIC ACID PLANT

NITROGEN OXIDES MONITORING

A2(a) The licensee shall continuously monitor the emission of NOx gases from the Nitric Acid Plant at a location immediately upstream of the Tail-Gas Expander following the Selective Catalytic Reduction Unit (CSBP ref: AN00753); and

A2(b) The monitoring system, required by part (a) of this condition, shall measure directly or otherwise estimate the following quantities expressed as 1 hourly averages:

(i) NOx concentration g/m³; and

(ii) NOx mass emission rate in g/s;

A2(c) The concentration of NOx gases emitted from the Nitric Acid Plant during operation, not including the half-hour period immediately following start-up, expressed as nitrogen dioxide, shall not exceed an hourly concentration of 0.41 g/m³.

NITROGEN OXIDES STARTUP LIMITATIONS

A3(a) The Nitric Acid Plant shall not start-up unless a monitoring system is in place to analyse startup emissions.

A3(b) A record shall be kept indicating the time, prevailing wind speed and direction, and the maximum half hourly NOx concentration in g/m³, during each start-up of the nitric acid plant.

A3(c) The NOx concentration of gases emitted from the Nitric Acid Plant during start-up, expressed as nitrogen dioxide, shall not exceed a half-hourly average concentration of 2.0 g/m³.

AMMONIUM NITRATE PRILLING PLANT

PARTICULATES MONITORING

A4(a) The licensee shall take grab samples of waste gases from the following Prilling Plant stacks at the given periodicity:

(i) For the Prilling Plant Tower stack: at least every six months;

(ii) For the Prilling Plant Pre-dryer and Dryer stacks: at least twelve times per annum carried out each month, or where for operational purposes a monthly sample cannot be taken, then the test shall be done as soon as practicably possible thereafter; and

A4(b) The stack testing required by part (a) of this condition, shall measure directly or otherwise estimate the following quantities expressed as 1 hourly averages:
WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENT
Environmental Protection Act 1986

LICENCE NUMBER: 6107/13
FILE NUMBER: L44/67

(iii) particulate concentration g/m³; and
(iv) particulate mass emission rate in g/s;

A4(c) Particulate emissions, determined in accordance with part (b) of this condition, shall not shall not exceed 0.25 g/m³ for the Prilling Plant Tower and Pre-drier and 0.35 g/m³ for the Prilling Plant Dryer.

A4(d) the licensee shall report all Prilling Plant stack tests taken for the purpose of estimating particulate emissions beyond the minimum requirements of part (a) of this condition.

CHLOR-ALKALI MANUFACTURING PLANT
MONITORING PROGRAMME FOR CHLORINE DISCHARGES

A5 The licensee shall
(i) monitor, via sensors, chlorine in gases emitted from the Chlor-Alkali Scrubber Stack.
(ii) take the immediate action detailed in the Quality Assurance Procedures when the concentration of chlorine, in gases emitted from the Chlor-Alkali Scrubber Stack, exceeds 1.5 mg/m³ (5 ppmvd).
(iii) keep a record of all events required to be acted upon under part (a)(ii) of this condition.

SUPERPHOSPHATE MANUFACTURING AND GRANULATION PLANTS
FLUORIDE MONITORING

A6(a) The licensee shall
(i) once every year take and analyse, using the relevant USEPA or other accredited method, grab samples of waste gases emitted from the Superphosphate Manufacturing Plant and Granulation Plant scrubber stacks; and
(ii) once every month, verify through Production Emissions Monitoring, limits required by part (c) of this condition.

A6(b) The stack sampling, required by part (a) of this condition, shall measure directly or otherwise estimate the following quantities:
(i) hydrofluoric acid concentration g/m³; and
(ii) hydrofluoric acid mass emission rate in g/s;

A6(c) Gaseous emissions from the Superphosphate Manufacturing Plant or the Granulation Plant scrubber stack shall not exceed:
(i) 0.05 g/m³ as hydrofluoric acid; and
(ii) 2630 kilograms per month as fluoride.
GRANULATION PLANT

AMMONIA MONITORING

A7(a) The licensee shall

(i) once every year take and analyse, using the relevant USEPA or other accredited method, grab samples of waste gases emitted from the Granulation Plant scrubber stacks; and

(ii) once every month when the plant is operating, verify through Production Emissions Monitoring, limits required by part (c) of this condition

A7(b) The stack sampling, required by part (a) of this condition, shall measure directly or otherwise estimate the following quantities:

(i) ammonia concentration g/m³; and

(ii) ammonia mass emission rate in g/s;

A7(c) Gaseous emissions from the Granulation Plant Scrubber Stack shall not exceed 1.0 g/m³ as ammonia.

2000 AMMONIA PLANT

MONITORING OXIDES OF NITROGEN

A8(a) The licensee shall once every month, when the plant is operating, take grab samples of waste gases emitted from the 2000 Ammonia Plant Primary Reformer Stack and Auxiliary Boiler Stack or, when for operational purposes a monthly sample cannot be taken, the test shall be done as soon as practicably possible in the month thereafter.

A8(b) The grab samples required by part (a) of this condition, shall measure directly or otherwise estimate the following quantities expressed as 1 hourly averages:

(i) NOx concentration mg/m³; and

(ii) NOx mass emission rate in g/s;

A8(c) Gaseous emissions from the 2000 Ammonia Plant primary reformer stack and auxiliary boiler stack shall not exceed 144 mg/m³ nitrogen oxides from either stack.
SEVERANCE

It is the intent of these licence conditions that they shall operate so that, if a condition or a part of a condition is beyond my power to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within my power to impose and are not otherwise *ultra vires* or invalid.

Officer delegated under section 20
Of the *Environmental Protection Act* 1986

Robert Atkins
DIRECTOR
ENVIRONMENTAL MANAGEMENT DIVISION

Date of Issue: Wednesday, 21 July 2004
ATTACHMENT 1: Major waste gas discharge points and groundwater monitoring bores.
ATTACHMENT 2: Gaseous emission points during normal operation

<table>
<thead>
<tr>
<th>Emission point</th>
<th>Emission point abbreviation</th>
<th>Stack height above ground level (m)</th>
<th>Density range (kg/m³)</th>
<th>Efflux velocity (m/s)</th>
<th>Volume (m³/s)</th>
<th>Exit Temp (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superphosphate Scrubber Stack</td>
<td>SMP</td>
<td>37.4</td>
<td>1.01</td>
<td>19.3</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Granulation Plant Scrubber Stack</td>
<td>GP</td>
<td>43.1</td>
<td>1.01</td>
<td>36.0</td>
<td>54</td>
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<td>Fan B</td>
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<td>• during startup</td>
<td></td>
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<td>• 100% load(2)</td>
<td></td>
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<tr>
<td>• 70% load(3)</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

(1) Note that the volume listed for Fans A, B, C and D are based on the volume as measured for Fan C.

(2) operating at 100% of full load

(3) operating at 70% of full load
APPENDIX 2

RESULTS OF AIR DISPERSION MODELLING
AIR DISPERSION MODELING
AMMONIUM NITRATE & NITRIC ACID PLANT UPGRADES

for

CSBP Ltd
1 February 2005

CSBP Ltd
PO Box 345
KWINANA WA 6966

Attention: Cameron Schuster

Dear Sir,

Air Dispersion Modeling: Ammonium Nitrate and Nitric Acid Plant Upgrades

Please find attached a final copy of the air dispersion modeling report for the ammonium nitrate and nitric acid plant upgrades, following comments made by the Department of Environment on the previously submitted draft report.

Yours faithfully
ENVIRON Australia Pty Ltd

Brian Bell
Manager WA
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AIR DISPERSION MODELING  
AMMONIUM NITRATE & NITRIC ACID PLANT UPGRADES  

for  
CSBP Ltd

1. INTRODUCTION

CSBP Ltd (CSBP) proposes to upgrade its ammonium nitrate and nitric acid manufacturing plants, and has requested ENVIRON to undertake air dispersion modeling to predict the subsequent impacts.

The current facility consists of an ammonium nitrate manufacturing plant (which has no atmospheric emission points), an ammonium nitrate prilling tower and a nitric acid manufacturing plant. The prilling tower has six stacks in total, these being a pre-dryer stack, a dryer stack and four identical tower stacks. The nitric acid plant has a single exit stack.

The upgrade will involve the construction of a new prilling plant, and a new nitric acid plant. The new prilling plant is proposed to use a different pollution control layout, and emissions will be via a single stack.

Modeling of nitric acid plant emissions has been undertaken on the assumption that the new nitric acid plant will be a duplicate of the existing plant. The specific technology to be employed in the new nitric acid plant had not been finalized at the time this modeling was performed, but emissions duplication is assumed to be the worst case scenario.

Following the upgrade, CSBP has indicated that the existing and new nitric acid plants will be operating concurrently. The existing and new prilling plants will also be operated concurrently for a period of at least one year. After this time, the existing prilling plant may be decommissioned, or additional pollution control equipment installed to enable the existing plant to operate for an extended period.
The scope of this study is as follows:

- Model the dispersion characteristics and subsequent ground level concentrations of oxides of nitrogen (NO\textsubscript{x}) from the nitric acid plants in the existing and upgrade scenarios;
- Model the dispersion characteristics and subsequent ground level concentrations of ammonia (NH\textsubscript{3}) and respirable particulates (PM\textsubscript{10}) from the prilling plants in the existing and upgrade scenarios;
- Predict the rate of particulate deposition, as a precursor to assessing the impacts of deposited nitrogen compounds into Cockburn Sound; and
- Assess the potential contribution of NO\textsubscript{x} emissions to photochemical smog.

2. **AIR DISPERSION MODELING**

2.1 **AIR DISPERSION MODELS**

The primary model used for this study was the Dispmod air dispersion model. Dispmod is a standard Guassian plume model developed by the Western Australian Department of Environment (DoE). It includes an algorithm that considers coastal fumigation effects on plume dispersion, and is therefore considered to be an appropriate model to predict dispersion characteristics of emissions on the Western Australian coastline.

The Dispmod air dispersion model does not include algorithms that consider the influence of building wake effects on plume dispersion. However, it is generally considered that building wake effects are not relevant for stacks with a release height 1.5 times that of the heights of surrounding buildings, which is the case for both the prilling tower and nitric acid plant stacks.

The Dispmod air dispersion model is not capable of modeling deposition of particulates. This component of the study was undertaken using the Industrial Source Complex 3 (ISC3) air dispersion model. ISC3 is one of the United States Environmental Protection Agency’s (USEPA) recommended air dispersion models, and is used extensively for regulatory assessments of industrial sources. It has been used to specifically assess particulate deposition into Cockburn Sound because it does not consider coastal fumigation effects. This effect is to only be relevant to locations inland of the plant, and therefore ISC3 is expected to provide a reasonable prediction of deposition rates into Cockburn Sound.
2.2 METEOROLOGICAL DATA

Meteorological data collected by the Department of Environment (DoE) in Hope Valley during the 1996 and 1980 calendar years respectively were used for Dispmod and ISC3 modeling. Hope Valley is located approximately 7 km north of the CSBP site in Kwinana Beach, and is considered to be generally representative of the meteorology of the area.

Note that the land-based Hope Valley data set may not be representative of meteorology over Cockburn Sound, which may be relevant to the particulate deposition modelling described in Section 4.5. However, this is the best available real data set. The alternative method of generating a theoretical meteorological data set for the near-shore area has not been undertaken as part of this assessment.

2.3 MODEL SETUP

The Dispmod air dispersion model was used to predict dispersion of ammonia and PM$_{10}$ emissions from the prilling plants and NO$_x$ emissions from the nitric acid plant. The model was set up with a 6 km$^2$ grid with 250 m grid spacing, centred on the emission sources.

The ISC3 air dispersion model was used to predict the deposition rate of particulates over Cockburn Sound. The model was set up with a 5 km$^2$ grid with 100 m grid spacing. It was positioned such that the emission sources were on the right hand side of the grid to maximize the extent of ocean coverage.

Samples of the Dispmod and ISC configuration files are provided as Attachment A.

3. EMISSIONS IMPACT ASSESSMENT: NITRIC ACID PLANT

3.1 ISSUES CONSIDERED

Oxides of nitrogen (NO$_x$) have been assessed to be the only compounds emitted from the nitric acid plant stack with the potential to cause significant impacts. NO$_x$ is an abbreviated term for all oxides of nitrogen, but primarily refers to nitric oxide (NO) and nitrogen dioxide (NO$_2$). NO is readily oxidized in ambient air to form NO$_2$. 
Air dispersion modeling was performed to assess the impact of the nitric acid plant duplication on NO$_2$ ground level concentrations. A qualitative assessment has also been undertaken of the potential for elevated NO$_x$ levels associated with the project to contribute to photochemical smog production.

### 3.2 AMBIENT AIR QUALITY STANDARDS

The Australian Commonwealth Government has produced a series of National Environmental Protection Measures (NEPM). The *National Environmental Protection (Ambient Air Quality) Measure* includes guidance on ambient air quality with respect to nitrogen dioxide. Since NO is readily converted to NO$_2$ in the ambient environment, this is considered to be representative of NO$_x$ generally.

The NEPM ambient air quality standards for NO$_2$ are:

- 1 hour average of 0.12 ppm (225 µg/m$^3$ @ 25°C) NO$_2$, with a 10 year goal of a maximum of one exceedence per year; and
- Annual average of 0.03 ppm (56 µg/m$^3$ @ 25°C) NO$_2$.

### 3.3 EMISSIONS DATA

Emissions data used in this study have been provided to ENVIRON by CSBP, and are presented in Table 1. The NO$_x$ emission rate was based on NO$_x$ monitoring results for the period July to September 2004, as measured by continuous in-stack monitoring equipment installed in the existing nitric acid plant stack. The proposed new plant was assumed for the purposes of this study to be a direct duplication of the existing plant.

<table>
<thead>
<tr>
<th>Stack Exit Height (m)</th>
<th>Existing Nitric Acid Plant</th>
<th>Proposed Nitric Acid Plant</th>
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</thead>
<tbody>
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<td>Stack Exit Diameter (m)</td>
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<td>Stack Exit Temperature (K)</td>
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<td>Air Flow at stack temperature (m$^3$/hr)</td>
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<tr>
<td>NO$_x$ Emission Rate (g/s)</td>
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</tr>
</tbody>
</table>

Whilst monitoring has not been conducted to determine the ratio of NO to NO$_2$ in the emission, it has been assumed that the molar ratio of NO to NO$_2$ in the emissions is 1:1 (ref: GP process flow diagram).
3.4 ASSESSMENT AGAINST AMBIENT AIR QUALITY CRITERIA

Air dispersion modeling of NOx emissions has been undertaken using the Dispmod air dispersion model, for the following scenarios:

- Current emissions scenario; and
- Cumulative emission scenario – operation of the existing and proposed plants.

Contour plots of the predicted maximum 1 hour and annual average ground level concentrations for each of these scenarios are presented as Figures 1 and 2. As would be expected with the plant duplication, predicted ground level concentrations in the upgrade scenario are approximately double those predicted for the current operating scenario.

The highest predicted ground level concentrations at locations that are readily accessible by the public are predicted to occur at Wells Park, a public recreation area located south of the CSBP site (with respect to Figures 1 and 2, Wells Park is located at approximate coordinates 383100 and 6432000). Predicted ground level concentrations at this location are presented in Table 2.

<table>
<thead>
<tr>
<th>Predicted NO\textsubscript{2} Ground Level Concentrations at Wells Park</th>
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<tr>
<td>Predicted Ground Level NO\textsubscript{2} Concentration (µg/m\textsuperscript{3})</td>
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<td>Current Scenario</td>
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<tr>
<td>Maximum 1hr Average</td>
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<td>Annual Average</td>
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Table 2 shows that whilst the upgrade is predicted to cause an increase in ground level concentrations, the contribution of the plant to maximum 1 hr average and the annual average concentrations at Wells Park are predicted to be 13% and 0.5% respectively of the respective NEPM criteria.

In January 2004, the Kwinana Industries Council (KIC) commissioned ENVIRON to conduct a preliminary atmospheric emissions screening assessment of Kwinana industries (ENVIRON 2004). In that study, National Pollutant Inventory (NPI) records were examined to identify those industries that emit various compounds to the atmosphere, and air dispersion modelling was undertaken to assess long-term cumulative impacts of emissions at selected community receptor locations, including at Wells Park.
The study concluded that cumulative emissions of NO\textsubscript{x} from industries in the Kwinana airshed did not lead to exceedences of NEPM annual average ambient air quality criterion at any of the locations, and that the highest predicted impacts were at Beeliar, approximately 10 km North of the CSBP site. CSBP is too distant from the Beeliar site to significantly contribute to ground level concentrations at that location, which have been attributed mainly to the nearby Cockburn Cement facility. The cumulative impact of emissions caused the predicted NO\textsubscript{2} ground level concentrations at this location to be approximatly 20% of the NEPM criteria. Predicted ground level concentrations at other receptor sites, including Wells Park, were not reported in this study, but were less than the figure reported for the Beeliar site.

Ambient NO\textsubscript{2} monitoring is conducted by the Department of Environment (DoE) at its Hope Valley and Rockingham ambient air quality monitoring stations. Reported results indicate that the daily peak 1 hr nitrogen dioxide levels did not exceed the 0.12 ppm 1 hr average NEPM ambient air quality criterion at the Rockingham or Hope Valley sites in 2003 (DoE, 2004). The results obtained for these stations were similar to those obtained at other metropolitan locations such as Duncraig and Quinns Rocks (with highest daily peak 1-hour concentrations of approximately 0.05 ppm), and significantly less than those obtained at the DoE’s Queens Buildings monitoring station in Perth City (which has experienced highest daily peak 1-hour concentrations approaching the NEPM criterion of 0.12 ppm). This indicates that non-industrial sources are probably more significant contributors to ambient nitrogen dioxide levels than industries on the Kwinana industrial strip. This conclusion is supported by the Perth Air Quality Management Plan, which indicates that motor vehicle exhausts are the greatest source of nitrogen dioxide emissions in Western Australian (DEP, 2000).

Based on the abovementioned studies, the predicted increase in ground level concentrations associated with the nitric acid plant upgraded is not likely to be significant in a regional context.

### 3.5 CONTRIBUTION TO PHOTOCHEMICAL SMOG PRODUCTION

Photochemical smog is an air pollution problem common in large cities. It is characterized by high ozone concentrations at ground level, and can be generated through the interaction of NO\textsubscript{x} and reactive organic compounds (ROC) in the environment. There are a number of potential NO\textsubscript{x} and ROC sources in the study area, such as industrial processes, vehicle exhausts and bushfires. An assessment has been made of the impact that the elevated NO\textsubscript{x} emissions associated with the nitric acid plant duplication may have on photochemical smog levels in the Perth airshed.

The relationship between NO\textsubscript{x} and ozone is an equilibrium between the following reactions:
\[
\begin{align*}
\text{NO}_2 + \text{light} & \rightarrow \text{NO} + \text{O} \\
\text{O} + \text{O}_2 & \rightarrow \text{O}_3 \quad \{\text{Ozone Production}\}
\end{align*}
\]

and
\[
\begin{align*}
\text{O}_3 + \text{NO} & \rightarrow \text{NO}_2 + \text{O}_2 \quad \{\text{Ozone Depletion}\}
\end{align*}
\]

From the above equations it can be seen that ozone production caused by elevated levels of NO\(_2\) is offset by ozone depletion caused when it is reduced by NO. Ozone build-up is only significant when NO levels are removed through other mechanisms, such as reaction with ROC. Since NO\(_x\) emissions from both the current and proposed nitric acid plants are comprised of a 1:1 molar ratio of NO to NO\(_2\), they are only likely to be significant for photochemical smog production in the event of NO depletion.

The meteorology of Perth is such that ozone formed via reactions between NO\(_x\) and ROC in the morning tends to be blown out to sea by prevailing winds, and then blown back onto land in a north-easterly direction by the sea breeze. Therefore the impact of ozone formed in Kwinana may be experienced elsewhere in the general Perth metropolitan region, particularly in Perth’s southwestern suburbs, which are located northeast of Kwinana.

As photochemical smog is characterized by high ozone concentrations at ground level, a review of ozone monitoring data collected at the Department of Environment at monitoring stations at Caversham, Quinns Rocks, Rockingham, Rolling Green, South Lake and Swanbourne was undertaken. The Rockingham site is located close to the Kwinana industrial area, and therefore provides information about ozone levels in the general area. The South Lake station is located inland to the north-east of the Kwinana industrial area, and would be expected to detect ozone initially produced at Kwinana and subsequently blown inland on the sea breeze.

Monitoring trends indicate that ozone levels at Rockingham and South Lake are generally lower than those at any of the other metropolitan stations (DoE, 2004), which indicates that ozone production in the Kwinana airshed is not a dominant driver of photochemical smog in Perth. The highest levels are recorded at the Caversham monitoring station, which is more likely to be influenced by ozone production in the CBD. Ozone concentrations at all stations tend to be below health standards, with exceedences observed rarely, and only for short periods.

The ozone monitoring studies appear to indicate that industry emissions from the Kwinana industrial area are not a defining factor in photochemical smog production in Perth. Given that the nitric acid plant NO\(_x\) emissions, both current and proposed, are a 1:1 molar ratio of NO to NO\(_2\), and are
relatively low, they are unlikely to be significant in the broader context of photochemical smog production in Perth.

In addition, *The Perth Photochemical Smog Study* (WP & DEP, 1996) concluded that motor vehicle emissions contributed more to NOx and ROC levels in the Perth airshed than industrial emissions, and that ozone production was greatest in areas where vehicle emissions were concentrated, such as the Perth central business district (CBD).

4. **EMISSIONS IMPACT ASSESSMENT: PRILL PLANT**

4.1 **ISSUES CONSIDERED**

The major emissions expected from the proposed new prill plant are ammonium nitrate particulates and ammonia.

Air dispersion modeling has been conducted to assess the impact of operating the new plant on ground level ammonia, PM$_{10}$ and PM$_{2.5}$ concentrations. Air dispersion modeling has also been conducted to predict the rate of particulate deposition into Cockburn Sound, and an estimate has been made of the total mass of particulates deposited into Cockburn Sound over a calendar year.

4.2 **AMBIENT AIR QUALITY STANDARDS**

4.2.1 **Particulates**

The ambient air quality NEPM (NEPC, 1998) specifies a 24 hour average PM$_{10}$ (i.e. particulate matter of diameter 10 micron or smaller) concentration of 50 µg/m$^3$, and this was used throughout this study.

Advisory reporting standards for PM$_{2.5}$ have been set in the ambient air quality NEPM. These are:

- 24 hour average PM$_{2.5}$ of 25 µg/m$^3$; and
- Annual average PM$_{2.5}$ of 8 µg/m$^3$. 
4.2.2 Ammonia

The NEPC has not set ambient air quality criteria for ammonia. However, various American and European agencies have set ammonia standards, and the following have been used in this study:

- 1 hr average – 3,200 µg/m³ (OEHHA, 2000)
- Annual average – 100 µg/m³ (USEPA, 2004)

The Office of Environmental Health Hazard Assessment (OEHHA) and United States Environmental Protection Authority (USEPA) standards are generally considered to be conservative, and are used extensively in health hazard assessments.

4.3 EMISSIONS DATA

The current prilling plant contains six stacks:

- Dryer stack;
- Pre-dryer stack; and
- 4 x Tower stacks mounted atop the prill tower.

The proposed new prill plant will utilize different pollution control technology, and gases will exhaust via a single stack.

The following scenarios have been considered:

1. Current operating scenario
2. Upgrade scenario A – operation of new prill plant in isolation at full capacity;
3. Upgrade scenario B – operation of new prill plant at reduced capacity, concurrent with operation of the existing prill plant modified by installation of pollution control equipment to the dryer and pre-dryer stacks to reduce coarse particulate emissions.

Stack parameters, emissions data and particle size distribution used in this study were provided to ENVIRON by CSBP and are presented in Table 3, 4 and 5 respectively.
Table 3: Prill Plant Stack Parameters

<table>
<thead>
<tr>
<th>Stack Exit Height (m)</th>
<th>Existing Plant</th>
<th>New Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dryer</td>
<td>Pre-dryer</td>
</tr>
<tr>
<td>Stack Exit Diameter (m)</td>
<td>34.2</td>
<td>34.2</td>
</tr>
<tr>
<td>Stack Exit Temperature (K)</td>
<td>313</td>
<td>338</td>
</tr>
<tr>
<td>Air Flow at stack temp (m³/hr)</td>
<td>60,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Stack Exit Velocity (m/s)</td>
<td>18.6</td>
<td>12.4</td>
</tr>
</tbody>
</table>

Notes: 1. The existing prill tower stacks are fitted with Chinaman’s hats, and the upward velocity is therefore considered to be zero for the purposes of air dispersion modeling.

Table 4: Prill Plant Emissions Data

<table>
<thead>
<tr>
<th></th>
<th>NH₃ (g/s)</th>
<th>Particulates (g/s)</th>
<th>PM₁₀ (g/s)</th>
<th>PM₂,₅ (g/s)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Dryer</td>
<td>0</td>
<td>1.5</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td>Dryer</td>
<td>0</td>
<td>1.17</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td>Tower (x4)¹</td>
<td>0</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>4.67</td>
<td>2.95</td>
<td>2.95</td>
</tr>
<tr>
<td>Pre-Dryer</td>
<td>New Prill Tower</td>
<td>4.17</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Dryer</td>
<td>0</td>
<td>0.37</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td>Tower (x4)¹</td>
<td>0</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
<td>0.5 (x4)</td>
</tr>
<tr>
<td>New Prill Tower</td>
<td>3.12</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>3.12</td>
<td>4.65</td>
<td>4.65</td>
<td>4.65</td>
</tr>
</tbody>
</table>

Notes: 1. The existing prill plant has four exhaust fans which emit to separate towers, but not all of these are operational at all times. As a worst-case scenario it has been assumed that emissions are occurring from all four stacks for short periods (i.e. 1-hour and 24-hour averaging periods) and from an average of two stacks over longer periods (i.e. 1-year averaging period).

2. No data were available for PM₂,₅ emissions. For the purposes of air dispersion modeling, all PM₁₀ particulates were assumed to be PM₂,₅.

Table 5: Particle Size Distribution Data

<table>
<thead>
<tr>
<th></th>
<th>0-10 µ</th>
<th>10-20 µ</th>
<th>20-30 µ</th>
<th>30-40 µ</th>
<th>40-50 µ</th>
<th>&gt;50 µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Pre-dryer Stack</td>
<td>0.24</td>
<td>0.33</td>
<td>0.24</td>
<td>0.16</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Current Dryer Stack</td>
<td>0.54</td>
<td>0.32</td>
<td>0.09</td>
<td>0.04</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>All other stacks, including upgraded pre-dryer and dryer stacks</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
4.4 ASSESSMENT AGAINST AMBIENT AIR QUALITY CRITERIA

4.4.1 Ammonia

Monitoring indicates that ammonia is not emitted in appreciable quantities from the current prilling plant stacks. However, air dispersion modeling has been undertaken on the basis that ammonia may be emitted from the new plant, with conservative emission rates assumed. The Dispmod air dispersion model has been undertaken to predict ground level concentrations of ammonia resulting from emissions when the new prill plant is operated in isolation under full capacity (upgrade scenario A), which would be the worst case upgrade scenario with respect to ammonia emissions.

Contour plots of the maximum 1 hour and annual average ground level concentrations for each scenario are presented in Figure 3. These show that the predicted maximum ground level concentrations at locations that are readily accessible to the public are in the order of 20 µg/m$^3$ (1 hr average) and 0.3 µg/m$^3$ (annual average). These are well below the ambient air quality criteria of 3,200 and 100 µg/m$^3$ respectively.

The KIC Phase 1 Screening Assessment (ENVIRON, 2004) assessed the long-term impacts of ammonia emissions from all major industries in Kwinana. The study predicted that the highest predicted ammonia ground level concentration at a community location would be at Wells Park, to the south of the CSBP site, and that the annual average concentration at this location would be approximately 50 µg/m$^3$, half the USEPA ambient air criterion. The WMC Resources site was considered to be the dominant contributor to ammonia at this location, with the CSBP contribution from all of its plants being approximately 6%. The predicted increase associated with the prill plant upgrade is therefore not considered to be significant in the context of cumulative impacts from Kwinana industries.

4.4.2 Respirable Particulates (PM$_{10}$)

The Dispmod air dispersion model was used to predict ground level PM$_{10}$ concentrations, assuming that PM$_{10}$ behaves as a gaseous contaminant. The following scenarios were modeled:

- Current operating scenario;
- Upgrade Scenario A (new prill plant in isolation); and
- Upgrade Scenario B (concurrent operation of existing and new prill plants).
Contour plots of the maximum 24 hr average ground level concentrations are presented in Figure 4. These show that PM$_{10}$ ground level concentrations are predicted to be marginally lower under Upgrade Scenario A, and to be marginally higher under Upgrade Scenario B, with the highest predicted offsite 24 hr average PM$_{10}$ concentrations for all scenarios ranging from 2-5 µg/m$^3$. This is well below the NEPM criterion of 50 µg/m$^3$.

The prill plant upgrade is therefore not predicted to lead a significant increase in PM$_{10}$ ground level concentrations.

4.4.3 Respirable Particulates (PM$_{2.5}$)

In the absence of PM$_{2.5}$ emissions data, all PM$_{10}$ particulates were assumed to be smaller than 2.5 micron for the purposes of air dispersion modeling (i.e. PM$_{10}$ = PM$_{2.5}$). This is likely to be an overestimate of PM$_{2.5}$ emissions as it does not account for any particles present in the 2.5 – 10 micron size fraction.

The maximum 24 hr average ground level concentration contour plots for PM$_{10}$ presented in Figure 4 are also appropriate for PM$_{2.5}$. The highest predicted off-site 24 hr average concentrations (2-5 µg/m$^3$ for all scenarios) is below the NEPM advisory reporting standard of 25 µg/m$^3$.

The Dispmod air dispersion model was used to predict the annual average ground level concentrations of PM$_{2.5}$ for each of the three scenarios presented in Section 4.4.2. Contour plots of annual average concentrations for each scenario are presented in Figure 5. These show that the highest offsite annual average ground level concentration is approximately 0.5 µg/m$^3$ for all scenarios, which is well below the NEPM advisory reporting standard of 8 µg/m$^3$.

4.5 PARTICULATE DEPOSITION OVER COCKBURN SOUND

Given that particulates emitted from the prill plant stacks are largely composed of ammonium nitrate particles, their deposition over Cockburn Sound may be a contributing factor to the total load of nitrogen entering the Sound. Modeling using the ISC3 air dispersion model was undertaken to predict the total load of particulates entering the Sound under the following scenarios:

- Current operating scenario;
- Upgrade Scenario A (new prill plant in isolation); and
- Upgrade Scenario B (concurrent operation of existing and new prill plants).
The particle size distribution used in modeling is presented in Table 5. Particle density and scavenging co-efficient were assumed to be consistent over all particle sizes, with values of 0.75 g/cm³ and 0.00068 s-mm/hr respectively.

Contour plots of predicted annual particulate deposition under each scenario are presented in Figures 5-7. They show that the deposition rate is predicted to decrease under both upgrade scenarios.

The total mass of particulates entering Cockburn Sound under each scenario has been estimated by drawing a 3 km² grid, with 500 m grid spacings over each contour plot (i.e. 36 grid squares with an area of 250,000 m²), and assuming a constant deposition rate over each of the grid squares. The assumed deposition rate over each grid square has been applied conservatively based upon the highest deposition rates predicted to occur at any point within that square. The assumed deposition rates over each grid square are shown pictorially on Figures 5-7.

The following calculation was used to estimate the total particulate load deposited over Cockburn Sound for each scenario:

\[ M_T = \sum \left( \frac{D_i \times A_i}{1000} \right) \]

Where:
- \( M_T \) = Total mass deposited per year into Cockburn Sound in kg/yr
- \( D_i \) = Deposition rate in g/m²/yr over a specific grid square
- \( A_i \) = Area of that grid square in m²
Using this formula, the total annual mass deposited for each scenario was estimated to be:

- Current operating scenario: 6 tonnes/yr
- Upgrade Scenario A: 0.75 tonnes/yr
- Upgrade Scenario B: 1.8 tonnes/yr

There will be a significant degree of error associated with these estimates, due to the conservative assumptions made about the deposition rate over each grid square (which will contribute to an over-prediction of mass deposited) and the grid size being restricted to the 3 km² area over which deposition rates were predicted to be highest (which will contribute to an under-prediction of mass deposited). However, since the method used for each scenario is consistent, comparison of the calculated deposition rates under each scenario should provide a reasonable indication of their relative impacts.

Particulate deposition on Cockburn Sound is therefore predicted to be reduced under either upgrade scenario.

5. SUMMARY OF RESULTS

The results of the air dispersion modeling indicates that there should be no significant air quality impacts associated with the nitric acid plant duplication or operation of the proposed new prill plant.

Ground level concentrations of NOₓ and NH₃ are predicted to be higher than the current operating scenario, but the increases are not expected to be significant in a regional context. Offsite ground level concentrations of PM₁₀ are not predicted to change significantly as a result of the proposal and particulate deposition rates over Cockburn Sound are predicted to decrease.

6. REFERENCES


Figures
Figure 1a
Maximum Predicted 1 Hour Average NOx
Ground Level Concentrations (µg/m³): Current Operating Scenario

Figure 1b
Maximum Predicted 1 Hour Average NOx
Ground Level Concentrations (µg/m³): Proposed Upgrade Scenario

Client: Wesfarmers CSBP
Project: AN Plant Upgrade
Drawn: GDA
Date: 1 Dec 2004
Figure 2a
Predicted Annual Average NO\textsubscript{x} Ground Level Concentrations (µg/m\textsuperscript{3}):
Current Operating Scenario

Figure 2b
Predicted Annual Average NO\textsubscript{x} Ground Level Concentrations (µg/m\textsuperscript{3}):
Proposed Upgrade Scenario

Client: Wesfarmers CSBP
Project: AN Plant Upgrade
Drawn: GDA
Date: 1 Dec 2004
Figure 3a
Maximum Predicted 1 Hour Average NH₃
Ground Level Concentrations (µg/m³)
Upgrade Scenario B

Figure 3b
Predicted Annual Average NH₃
Ground Level Concentrations (µg/m³)
Upgrade Scenario B

Client: Wesfarmers CSBP
Project: AN Plant Upgrade
Drawn: GDA
Date: 3 Dec 2004
Figure 4a
Maximum Predicted 24 Hr Average PM$_{10}$ Ground Level Concentrations (µg/m$^3$)
Current Scenario

Figure 4b
Maximum Predicted 24 Hr Average PM$_{10}$ Ground Level Concentrations (µg/m$^3$)
Upgrade Scenario A
(New Plant in Isolation)

Figure 4c
Maximum Predicted 24 Hr Average PM$_{10}$ Ground Level Concentrations (µg/m$^3$)
Upgrade Scenario B
(Concurrent Operation of Existing and New Plants)
Figure 5a
Predicted Annual Average PM$_{2.5}$ Ground Level Concentrations (µg/m$^3$)
Current Scenario

Figure 5b
Predicted Annual Average PM$_{2.5}$ Ground Level Concentrations (µg/m$^3$)
Upgrade Scenario A
(New Plant in Isolation)

Figure 5c
Predicted Annual Average PM$_{2.5}$ Ground Level Concentrations (µg/m$^3$)
Upgrade Scenario B
(Concurrent Operation of Existing and New Plants)
Figure 6
Predicted Particulate Deposition Rates – Current Emissions Scenario

- 2 g/m²/yr
- 1 g/m²/yr
- 0.75 g/m²/yr
- 0.5 g/m²/yr

Client: CSBP Ltd
Project: AN Plant upgrade
Drawn: GDA
Date: 3 Dec 04
Figure 7
Predicted Particulate Deposition Rates – New Plant in Isolation

Client: CSBP Ltd
Project: AN Plant Upgrade
Drawn: GDA
Date: 3 Dec 04
Figure 8
Predicted Particulate Deposition Rates – Concurrent Operation of Existing and New Prill Plants

Client: CSBP Ltd
Project: AN Plant Upgrade
Drawn: GDA
Date: 3 Dec 04
Appendix A

Sample Dispmod and ISC Configuration Files
Sample Dispmod Configuration File

CSBP - Ammonium Nitrate Plant
381250. 6430100. 100. 51 51 0.2833 -32.0 181.7 3.0 .083 .047 0.25
010196 311296 0000 2400 3 1 77 1.9 2.3
4 0.00 0350. 0500. 0700. 1000. 0 5000.
1
1
0 ! NUMBER OF STACKS THAT ARE NOT BEING USED
Prill 1 65.0 2.3 383921 6432588 1.00 0.6000

CSBP - Ammonium Nitrate Plant
Name Q V Rho Nd Nh Int
Stack 1 .0042 62.7 1.300 0 0 0

Sample ISC3 Configuration file

**
*****************************************************
** ISCST3 Input Produced by:
** ISC-AERMOD View Ver. 4.6.2
** Lakes Environmental Software Inc.
** Date: 25/11/2004
** File: C:\ISCView4\Clients\CSBP\Prill Plant Deposition Modeling\prill1.INP
**
*****************************************************
**
*****************************************************
** ISCST3 Control Pathway
*****************************************************
**
**
CO STARTING
TITLEONE C:\ISCView4\Clients\CSBP\Prill Plant Deposition Modeling\prill1.isc
MODELOPT DEFAULT DEPOS RURAL
AVERTIME PERIOD
POLLUTID TSP
TERRHGTFS FLAT
RUNORNOT RUN
CO FINISHED
**
** ISCST3 Source Pathway
****************************************

** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
LOCATION PRED POINT 383596.000 6432365.000
** DESCRSRC Existing Pre-Dryer Stack
LOCATION DRYER POINT 383596.000 6432387.000
** DESCRSRC Existing Dryer Stack
LOCATION TOWER1 POINT 383598.000 6432415.000
** DESCRSRC Existing Prill Tower (1st of 4 stacks)
LOCATION TOWER2 POINT 383598.000 6432415.000
** DESCRSRC Existing Prill Tower (2nd of 4 stacks)
LOCATION TOWER3 POINT 383598.000 6432415.000
** DESCRSRC Existing Prill Tower (3rd of 4 stacks)
LOCATION TOWER4 POINT 383598.000 6432415.000
** DESCRSRC Existing Prill Tower (4th of 4 stacks)
LOCATION NEWPT2 POINT 383921.000 6432588.000
** DESCRSRC New Prilling tower with lower emissions scenario
LOCATION NEWPT3 POINT 383921.000 6432588.000
** DESCRSRC New Prilling Plant operated in conjunction with existing plant

** Source Parameters **
SRCPARAM PRED 1.5 34.176 338.000 12.42000 1.067
SRCPARAM DRYER 1.16 34.176 313.000 18.64000 1.067
SRCPARAM TOWER1 0.33 66.520 317.000 0.00000 1.537
SRCPARAM TOWER2 0.33 66.520 317.000 0.00000 1.537
SRCPARAM TOWER3 0.33 66.520 317.000 0.00000 1.537
SRCPARAM TOWER4 0.33 66.520 317.000 0.00000 1.537
SRCPARAM NEWPT2 2.775 65.000 308.000 15.08000 2.300
SRCPARAM NEWPT3 2.22 65.000 308.000 12.07000 2.300
PARTDIAM DRYER 10 20 30 40 50
PARTDIAM PRED 10 20 30 40 50
PARTDIAM TOWER1 10
PARTDIAM TOWER2 10
PARTDIAM TOWER3 10
PARTDIAM TOWER4 10
PARTDIAM NEWPT3 10
PARTDIAM NEWPT2 10
MASSFRAX DRYER 0.54 0.32 0.09 0.04 0.01
MASSFRAX PRED 0.24 0.33 0.24 0.16 0.03
MASSFRAX TOWER1 1
MASSFRAX TOWER2 1
MASSFRAX TOWER3 1
MASSFRAX TOWER4 1
MASSFRAX NEWPT3 1
MASSFRAX NEWPT2 1
PARTDENS DRYER 0.75 0.75 0.75 0.75 0.75
PARTDENS PRED 0.75 0.75 0.75 0.75 0.75
PARTDENS TOWER1 0.75
PARTDENS TOWER2 0.75
PARTDENS TOWER3 0.75  
PARTDENS TOWER4 0.75  
PARTDENS NEWPT3 0.75  
PARTDENS NEWPT2 0.75  
PARTSLIQ DRYER 0.00068 0.00068 0.00068 0.00068 0.00068  
PARTSICE DRYER 0.00068 0.00068 0.00068 0.00068 0.00068  
PARTSLIQ PRED 0.00068 0.00068 0.00068 0.00068 0.00068  
PARTSICE PRED 0.00068 0.00068 0.00068 0.00068 0.00068  
PARTSLIQ TOWER1 0.00068  
PARTSICE TOWER1 0.00068  
PARTSLIQ TOWER2 0.00068  
PARTSICE TOWER2 0.00068  
PARTSLIQ TOWER3 0.00068  
PARTSICE TOWER3 0.00068  
PARTSLIQ TOWER4 0.00068  
PARTSICE TOWER4 0.00068  
PARTSLIQ NEWPT3 0.00068  
PARTSICE NEWPT3 0.00068  
PARTSLIQ NEWPT2 0.00068  
PARTSICE NEWPT2 0.00068  

** SRCGROUP EXIST DRYER PRED TOWER1 TOWER2 TOWER3 TOWER4  
** SRCGROUP NEWPRILL DRYER PRED TOWER1 TOWER2 TOWER3 TOWER4 NEWPT3  
** SRCGROUP NEWPT2 NEWPT2  

SO FINISHED  
**  
****************************************  
** ISCST3 Receptor Pathway  
****************************************  
**  
**  
RE STARTING  
GRIDCART UCART1 STA  
XYINC 379200.00 51 100.00 6430000.00 51 100.00  
GRIDCART UCART1 END  
RE FINISHED  
**  
****************************************  
** ISCST3 Meteorology Pathway  
****************************************  
**  
**  
ME STARTING  
INPUTFIL HV80ISC.MET  
ANEMHGHT 10 METERS  
SURFDATA 1 1980  
UAIRDATA 1 1980  
ME FINISHED  
**  
****************************************  
** ISCST3 Output Pathway  
****************************************  
**  
**  
Ref: X:\Projects_and_Clients\CSBP\30-0136 Cyanide Plant and AN Plant Upgrades\30-0136B Ammonium Nitrate Plant Upgrade\AN Plant Upgrade Air Dispersion Modeling Report.doc
OU STARTING
** Auto-Generated Plotfiles
   PLOTFILE PERIOD EXIST prill1.IS\PE00G001.PLT
   PLOTFILE PERIOD NEWPRILL prill1.IS\PE00G002.PLT
   PLOTFILE PERIOD NEWPT2 prill1.IS\PE00G003.PLT
OU FINISHED
APPENDIX 3

HEALTH EFFECTS OF AMMONIUM NITRATE PARTICLES IN THE AIR
APPENDIX 4

RESULTS OF NOISE EMISSION STUDY
CSBP LIMITED

CSBP AMMONIUM NITRATE EXPANSION PROJECT
KWINANA

NOISE EMISSION STUDY

BY

HERRING STORER ACOUSTICS

NOVEMBER 2004

OUR REFERENCE: 3926-4-04188-1
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1.0 INTRODUCTION

2.0 SUMMARY

3.0 METHODOLOGY

4.0 REGULATORY CRITERIA

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6.0 PREDICTED NOISE LEVELS AT INDUSTRIAL RECEIVERS

   6.1 Measured Noise Levels of Existing Operations
   6.2 Predicted Noise Levels of Proposed Expansion

7.0 DISCUSSION

APPENDICES

A Far-field Noise Contours

B Near-field Noise Contours CSBP Plant
1.0 INTRODUCTION

CSBP Limited commissioned Herring Storer Acoustics to develop an acoustic model to predict noise emission from the proposed new Ammonium Nitrate Expansion Project at CSBP Kwinana. The expansion also includes the cumulative effect of other proposed expansions on site, namely an upgrade of the Sodium Cyanide Plant Solids and Sodium Cyanide Plant No.2 plants.

The objective of this study is to predict the noise emissions from the proposed expansion, separately and in conjunction with all other CSBP / AGR existing and proposed plant, and assess the noise level at the nearest significant premises in accordance with the Environmental Protection (Noise) Regulations 1997.

2.0 SUMMARY

Noise level propagation to the surrounding noise sensitive areas has been modelled for plant operation noise and assessed against the Environmental Protection (Noise) Regulations 1997. The sound power levels used in the predictive modelling were based on measurements of existing plant and calculation of the likely sound power increases due to the AGR plant expansion.

The assessment has assumed that noise emissions from the whole of CSBP plant operation will be tonal.

The noise emissions have been calculated using the computer program SoundPlan 5.6 with parameters in accordance with the Department of Environmental Protection document “EPA Draft Guidance for Assessment of Environmental Factors No. 8 - Environmental Noise” (refer Methodology section for details).

Noise emissions for the proposed new Nitric Acid, Ammonium Nitrate and Prilling plants comply with the Regulation requirements at the nearest residential receiver locations. The acoustic modelling shows that the predicted noise emissions from the CSBP site (existing with proposed expansions) are well within the Regulation ‘assigned level’ of 35 LA10 for residential premises under ‘worst case’ night weather conditions.

In combination with other industrial noise emitters, the noise from CSBP is not a significant contributor for all locations except Medina. At Medina the noise from CSBP operations is predicted to be 31.0 LA10, which is ‘just’ significantly contributing to an exceedance of the assigned level of 35 LA10. The predicted CSBP noise contribution of 31 LA10 is significantly less than the KIC predicted level of 48 LA10 (due to cumulative effect of all industry) and at a level of at least 15 dB(A) less than the KIC predicted overall noise level, would be inaudible at Medina.

The proposed expansion incorporates noise control by means of the acoustic enclosure of the existing and proposed Nitric Acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors.

The predicted noise levels at the nearest industrial premises (BP Refinery) currently exceeds the Regulation ‘assigned level’ of 65 LA10. The predicted noise emissions are expected to increase up at the BP Refinery boundary. Both existing and predicted noise emissions are expected to comply with the proposed Regulation Review level of 70 LA10 (no characteristic adjustment required) criteria being pursued by the DoE.
3.0 METHODOLOGY

Prediction of the noise level propagation to surrounding areas was achieved utilising the computer program SoundPlan 5.6. This program incorporates various parameters including source sound power levels, ground topography and atmospheric conditions in determining propagation of noise from the site. The CSBP Kwinana acoustic model was upgraded from a 2002 model utilizing the ENM noise modelling software.

Measurements were conducted around key plant items to re-develop aspects of the model to reflect a greater interest in localized noise levels and to incorporate the changes in noise emissions of the plant which have occurred over the last few years. Major reductions in noise emissions have occurred as a result of attenuator maintenance for the existing Nitric Acid stack, as well as a program of engineering controls on minor noise sources such as steam vents.

Using recognised algorithms (Concawe) the program calculates the sound levels at distances from the source resulting in noise levels at receiver locations.

Single point calculations were carried out to rank the contribution of each source at a particular location, namely the nearest boundary of the BP Refinery, and residential locations in Medina, Calista, Leda, Hillman and North Rockingham.

The major noise sources proposed are:

Nitric Acid / Ammonium Nitrate Plant: Duplication of existing plant, incorporating existing noise control measures. The proposed expansion incorporates noise control by means of the acoustic enclosure of the existing and proposed Nitric Acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors.

Prilling Plant No.2: New prilling plant incorporating process improvements. Major noise sources are fans which will be acoustically attenuated to minimize noise emissions. Noise emissions from the new prilling plant are not expected to be significant.

4.0 REGULATORY CRITERIA

The criteria used is in accordance with the Environmental Protection (Noise) Regulations 1997 (as amended). These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within the two circles, having a radii of 100m and 450m from the premises of concern.
The above levels are conditional on no annoying characteristics existing in the noise of concern, such as tonality, amplitude modulation or impulsiveness. If such characteristic exist then any measured level is adjusted according to Table 2 below.

The DoE is in the process of a ‘Regulation Review’ (refer: Noise Regulations Review: Outcomes of the Working Group Programme, June 2000), and industrial noise ‘assigned levels’ are one area where a change is likely to occur. The most recent discussion with the DoE has revealed that a proposal to increase the Industrial Receiver ‘assigned level’ from **65 \( L_{A10} \)** to **70 \( L_{A10} \)** is being pursued, with the adjustments for noise characteristic not being applicable. Where an industrial premises has offices or other noise affected areas then the level would remain at **65 \( L_{A10} \)**, but the noise characteristic adjustments would not be applicable. A timeframe for regulation drafting and public review is not well defined but potentially concluded by the end of 2005. We note that should the expected Regulation review be concluded in accordance with the DoE proposal, the ‘assigned level’ at the Industrial boundary(s) adjacent CSBP Kwinana would be **70 \( L_{A10} \)** (no noise characteristic adjustments required).
5.0  **PREDICTED NOISE LEVELS AT RESIDENTIAL PREMISES**

Predicted noise levels from the single point calculations are summarised below in Table 3 ‘worst case’ night-time conditions of 3 m/s wind from source to receiver with temperature inversion.

**TABLE 3 - RESULTS OF SINGLE POINT CALCULATIONS OPERATIONAL NOISE AT RESIDENTIAL PREMISES**

<table>
<thead>
<tr>
<th>Location</th>
<th>Existing $L_{A10}$</th>
<th>Expansion $L_{A10}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medina Residence</td>
<td>30.8</td>
<td>31.0</td>
</tr>
<tr>
<td>Calista Residence</td>
<td>29.4</td>
<td>29.5</td>
</tr>
<tr>
<td>Leda Residence</td>
<td>26</td>
<td>26.4</td>
</tr>
<tr>
<td>Hillman Residence</td>
<td>22.2</td>
<td>22.0</td>
</tr>
<tr>
<td>North Rockingham (near CBH)</td>
<td>24.9</td>
<td>25.4</td>
</tr>
<tr>
<td>East Rockingham (coast)</td>
<td>19.5</td>
<td>20.1</td>
</tr>
</tbody>
</table>

Note: $t$ – tonal noise

The single point calculations and the corresponding noise contour plots (Appendix A) show that the noise emissions from CSBP are generally below 30 $L_{A10}$, with a nominal 0.1 – 0.2 dB increase as a consequence of all the proposed expansions at CSBP. The exceptions are at the nearest residential location (Medina) where the predicted level is up to 31 $L_{A10}$ from the CSBP operations under adverse wind conditions at night, with a temperature inversion. The contribution of the proposed expansions at the AGR plant are not significant with respect to the predicted noise levels at Medina. The predicted noise level of 31.0 $L_{A10}$ at Medina is made up of the following noise contributors.

<table>
<thead>
<tr>
<th>CSBP Noise Contributor</th>
<th>Noise Level Contribution at Medina</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSBP Existing Main Plant</td>
<td>25.6</td>
</tr>
<tr>
<td>CSBP Ammonium Nitrate Expansion Project</td>
<td>15.43</td>
</tr>
<tr>
<td>Sodium Cyanide Plant Existing Plant</td>
<td>29.3</td>
</tr>
<tr>
<td>Sodium Cyanide Plant Expansion Project</td>
<td>4.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>31.0</td>
</tr>
</tbody>
</table>

It is evident that the proposed CSBP expansions are not significant contributors to the noise received at the Medina residential area. The proposed expansions increase the overall predicted noise emissions to Medina by 0.1 dB under the night climatic conditions of 3 m/s wind from CSBP to Medina, with temperature inversion.

The 2001 KIC noise study and Kwinana acoustic model predicted noise levels at residential receiver locations under a range of weather conditions. A summary of the predicted and measured noise levels from the KIC report, together with the current predicted CSBP noise emissions are shown for comparison purposes. The significant noise reductions achieved at CSBP since the original study are reflected in the much lower predicted noise levels at the residential receiver locations.
### TABLE 4 – COMPARISON OF OPERATIONAL NOISE AT RESIDENTIAL PREMISES

<table>
<thead>
<tr>
<th>Residential Receiver Location</th>
<th>Wind Direction / Speed Inversion Lapse Rate</th>
<th>KIC Overall Level 2001</th>
<th>KIC CSBP Contribution 2001</th>
<th>CSBP Expansion Contribution 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calista (predicted)</td>
<td>W 3 2</td>
<td>43.5</td>
<td>38.9</td>
<td>29.5</td>
</tr>
<tr>
<td>Calista (KIC measured)</td>
<td>W 2 0</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medina (predicted)</td>
<td>NW 3 2</td>
<td>48.0</td>
<td>38.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Medina (KIC measured)</td>
<td>NW 2 0</td>
<td>44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above figures show that there has been a reduction in predicted noise level at Calista due to CSBP operations from 38.9 to 29.5 LA10. At a level of 29.5 LA10 the CSBP noise emissions are not technically classified as ‘significantly contributing’ and comply with the Regulation ‘assigned level’ of 35 LA10 at Calista residences. The contributing source ranking from the KIC report changes from 1st ranked contributor to 4th ranked contributor (assuming other industry noise emissions are unchanged).

For Medina the figures show that there has been a reduction in predicted noise level due to CSBP operations from 38.0 to 31.0 LA10. At a level of 31.0 LA10 the CSBP noise emissions are technically classified as ‘significantly contributing’ to the Regulation ‘assigned level’ of 35 LA10 at Medina residences. However at 31.0 LA10, the noise contribution from CSBP would be more than 5 dB(A) less than the overall noise level (based on KIC measured / predicted levels) and unlikely to be audible. The contributing source ranking from the KIC report changes from 1st ranked contributor to 5th ranked contributor (assuming other industry noise emissions are unchanged).

The reductions in noise received at residential locations over recent years (since the 2001 KIC acoustic modelling and report) are due to noise control measures implemented by CSBP. The high initial noise emission levels were due in part to a newly commissioned plant (KAP) that was emitting more noise than anticipated due to contractor design issues. The proposed Ammonium Nitrate Expansion Project is expected to have a negligible effect on noise emissions from the CSBP site.

### 6.0 PREDICTED NOISE LEVELS AT INDUSTRIAL RECEIVERS

#### 6.1 MEASURED NOISE LEVELS OF EXISTING OPERATIONS

In the process of upgrading the acoustic model of the existing CSBP operations, boundary noise levels were measured at the BP Refinery boundary. Measured noise levels ranged from 54 – 72 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the KAP plant located relatively close to the BP Refinery boundary (CSBP environmental sample point #3).
The existing noise emissions fail to comply with the Regulation industrial receiver ‘assigned level’ of 65 LA10 mainly along the northern boundary of the KAP plant. It is noted that were the Regulation ‘assigned levels’ to be changed in accordance with the recommendations of the “Noise Regulations Review: Outcomes of the Working Group Programme, June 2000”, or the proposed regulation changes as currently being proposed by DoE, then the existing noise levels at the BP Refinery boundary would be in compliance with the Regulations except for a small section next to the KAP plant. Construction of a barrier fence (solid) at this location could enable compliance at this location.

The acoustic model under ‘worst case’ daytime conditions of wind towards the BP Refinery at 4 m/s have slightly higher predicted noise levels than measured (due to the wind effect on propagation of noise).

6.2 PREDICTED NOISE LEVELS OF PROPOSED EXPANSION

The significant noise source is the proposed new Nitric Acid Plant, which is anticipated to be a duplicate of the existing Nitric Acid Plant. The major noise source in the Nitric Acid Plant is the compressor, and the noise radiated from ductwork to and from the intercooler heat exchangers. The discharge stack is also a potential emitter of significant noise, however the maintenance on the discharge attenuator was able to significantly reduce emitted sound power in the existing unit, and a similar performance is expected from the new unit.

There is potential to improve on the existing noise control measures incorporated in Nitric Acid Plant No.1. The noise control measures currently incorporated into the existing Nitric Acid plant include:

- Compressor House enclosure incorporates chequer-plate floor to control noise breakout, and acoustic lining of inner walls to reduce internal noise levels.
- Acoustic lagging of compressor to intercooler ductwork
- Acoustic lagging of compressor to discharge silencer ductwork
- Discharge silencer

It is proposed to carry out additional noise control for the existing and proposed Nitric Acid plants. The additional noise control is acoustic enclosure of the existing and proposed Nitric Acid plant compressor intercooler heat exchangers and associated pipe-work from and to the compressors.

A section of sheet metal fencing can be provided on the common boundary near the existing KAP to reduce sound transmission towards BP refinery from this noise source.
The predicted noise levels from the expansion at the BP Refinery nearest boundary under ‘worst case’ daytime wind conditions are:

<table>
<thead>
<tr>
<th>Location</th>
<th>Existing, $L_{A10}$</th>
<th>Expansion, $L_{A10}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opposite Nitric Acid Plant No.2</td>
<td>62</td>
<td>69</td>
</tr>
</tbody>
</table>

The predicted noise levels with the addition of Nitric Acid Plant No.2, Ammonium Nitrate Plant No.2 and Prilling Plant No.2 show an increased noise level at the BP Refinery boundary. The predicted noise level of 69 $L_{A10}$ is (4 + 5 adjustment =) 9 dB in excess of the current Regulation ‘assigned level’. However, the predicted level of 69 $L_{A10}$ would comply with the proposed Regulation Review ‘assigned level’ of 70 $L_{A10}$ (no noise characteristic applicable).

For: HERRING STORER ACOUSTICS

Paul Drew

29 November 2004
APPENDIX A

FAR-FIELD NOISE CONTOURS
APPENDIX B

NEAR-FIELD NOISE CONTOURS CSBP PLANT
CSBP BASE 2004 Noise Contours
Worst Case Day, 4 m/s wind
APPENDIX 5

PRELIMINARY RISK ANALYSIS
PRA of Proposed Ammonium Nitrate Production Expansion Project at CSBP Kwinana Industrial Complex

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Job No: CSB16P
Revision No: 4
Prepared By: Michael Sheehy
Checked By: Jason Muirhead
Approved By: Nick Hardy
Date: 28th December 2004

Qest Consulting Pty Ltd ABN: 41 055 743 345

This document is confidential and may not be used other than in accordance with the Services Agreement and Terms and Conditions entered into by the client with Qest Consulting Pty Ltd without the prior written consent of Qest Consulting Pty Ltd.
1. PUBLIC ENVIRONMENTAL REVIEW RISK SUBMISSION

This Preliminary Risk Assessment (PRA) has been commissioned from Qest Consulting by CSBP. It concerns the proposed expansion of the Ammonium Nitrate Facility at the CSBP Kwinana Industrial Complex. Three expansion layout options have been considered using the methodology required under the Public Environmental Review (PER) submission process prescribed by the Western Australian (WA) Environmental Protection Agency [EPA 2000].

This document is a summary of the full PRA and is presented to allow persons to form a view of the proposed expansion. Detailed technical review should refer to the full PRA.

The CSBP Kwinana Industrial Complex is a Major Hazard Facility because it manufactures, handles & transports materials at tonnages greater than the threshold quantities specified by the WA Department of Industry & Resources (DoIR). The DoIR requirements are consistent with the requirements of National Standard NOHSC: 1014 and the associated National Code Of Practice.

In accordance with the compliance requirements for Major Hazard Facilities in WA, CSBP maintains a Quantitative Risk Model of the CSBP Kwinana Industrial Complex in order to:

1. Better understand the potential for Major Accidents at the facility in terms of consequence and likelihood;
2. To tailor activities at the facility so that, cumulatively, these risks are minimised to levels that can be considered As Low As Reasonably Practicable (ALARP); and
3. To demonstrate compliance with the risk criteria applied to such facilities in WA.

The Qest assessment shows that the risk levels posed by the current and proposed expanded ammonium nitrate facilities, meet the Regulatory Risk Criteria [EPA 2000]. The primary risk driver for the plant under consideration here, the current Ammonium Nitrate Facility, is the Ammonium Nitrate Solution Storage Tank which has the potential to detonate and cause significant damage as a result of the associated overpressure. For the new, expanded facility this tank has been sized for a smaller operating inventory (40% of current practice) and would be located farther away from the refrigerated ammonia storage tanks to a point where overpressures would have no impact. The reduction in risk that this design feature affords is significant.

Additional import / export activities at the Kwinana Bulk Jetty also satisfy the EPA Risk Criteria. Wells Park, the nearest location to which the public have access (440m away), would not be exposed to significant consequences from a major accident at the facility.

The conclusions drawn with regard to the risk profile have been the product of an orthodox Qualitative Risk Assessment (QRA) methodology supplemented by the following activities:

- Formal workshops with CSBP staff to confirm the suitability of input data and review the relative ranking of risks.
- A complete revision of Ammonium Nitrate explosion consequence models in keeping with research from post-Toulouse investigations [Dechy 2004] and current heightened community concern.
- A series of sensitivity tests have been carried out where good practice warranted specific investigation (e.g toxic impacts, release characteristics etc).

2. CUMULATIVE RISK FROM THE CURRENT WHOLE SITE

The cumulative risk for the whole site is shown in Figure 2.1. As previously, the EPA criteria are exceeded at the points marked as “Boundary Fence Points 1 & 2”, the responses to which are presented in the Kwinana Works Total Site Quantitative Risk Assessment [Qest-CSB18P 2004] and summarised as:
Figure 2.1 Summary of Offsite Risk Contributors from Current Whole Site Risk Assessment

- **Boundary Fence Point 1**
  - Refrigerated Ammonia Storage
  - All other ABU cases, Natural gas line to EP and NG, from Nitric Acid Tower

- **Boundary Fence Point 2**
  - Ammonia supply to SCP
  - Chlorine Cylinder and Drum Filling
  - Chlorine Bullets and Gas Purification Plant ignited releases (very localised effect)
  - Sodium Cyanide Plants Vaporisers

- **Boundary Fence Point 3**
  - Ammonia Import / Export (via jetty)

---

**EPA LIMITING CRITERIA**

- **Within Site**: Public open space, Commercial areas, Residential areas, Sensitive areas, Property Boundary

**Contour Criteria**: Plant Boundary, Public Open Space, Commercial Activity, Residential Populations, Sensitive Populations
Boundary Fence Point 1: CSBP and BP personnel have implemented a liaison process with regard to Emergency Response Planning, with BP personnel working within this area inducted into the CSBP safety management system, ensuring they know how to respond appropriately.

Boundary Fence Point 2: The extent of the exceedance is limited (several meters) and is within the rail corridor between CSBP and Coogee Chemicals. Considering this, there is minimal chance for off-site populations to be affected as, as there is limited access to the rail corridor and the Emergency Response Plan warns trains if a release occurs. Finally the consequence modelling uses a ‘best estimate conservative’ approach to the analysis which never knowingly underestimates the impact and hence can be safely considered to contain an element of conservatism.

3. CUMULATIVE RISK FROM THE PROPOSED EXPANDED WHOLE SITE

The PRA is concerned with the impact to cumulative site profile that the proposed expansion of the Ammonium Nitrate facility (covering the current and additional Ammonium Nitrate plant, the Prill Plant, Prill Storage and jetty operations) will have on the whole site contours. The assessment of the expanded facility considered three proposed configurations and it concluded that all three options comply with the EPA risk criteria. The process involved for each of the three layouts are the same, only the location of the plant sections is altered compared to the existing facility. The process changes are:

- Addition of a second Nitric Acid/Ammonium Nitrate Plant as a duplicate of the current plant and located roughly 75m NNE of the current plant.
- The 730 m$^3$ (equivalent to 900 tonnes) 91% Ammonium Nitrate Solution Storage tank will be replaced with a 250 m$^3$ (equivalent to 350 tonnes) tank, which will be located in one of three places suggested in the three site layout options. The 730 m$^3$ Ammonium Nitrate Solution Storage tank will store 70% solution, which is not classified as a dangerous good.
- An additional Prill Plant 50% larger than the existing plant will be constructed, located in one of three places suggested in the three site layout options.
- The storage of Bulk and Bagged Prill will not be increased but rearranged with the potential for relocation to one of three places within the project envelope. A small export transit store to be based west of the current Prill storage.
- Bagged Prill will be exported from the Kwinana Bulk Jetty North Arm 24 times a year in 4000 tonne shipments, in addition to the 12 shipments a year currently allocated to Dyno Nobel.

Since the three layout options only change the location of the Ammonium Nitrate Solution Storage, Prill Plant and Prill Storage, the offsite risk from the three layout options does not change. This is because Ammonium Nitrate hazards from those sections of plant do not contribute to offsite risk, hence their movements with different layout options does not vary the offsite risk.

The cumulative risk contours of the current and proposed whole site risk are shown for comparison in Figure 3.1 and Figure 3.2. What is demonstrated is that long distance low level risk from the northern portion of the site is reduced in the proposed whole site risk. This is due to the changes in Sections 3.1 and 3.2.

3.1. Ammonium Nitrate Solution Storage Tank

Reduction of the Ammonium Nitrate Solution Storage tank in size (from 900 to 350 tonnes) and relocating it to the east of the property prevents the explosion of the AN tank causing failure of the Refrigerated Ammonia Tanks (Table 3.1). This also removes the "knock-on" frequency associated with the Ammonia Tank failure case, which is a significant portion of the total tank rupture frequency. Accordingly, the long distance effects of the Ammonia Storage tank rupture reduce in risk to such a level as to be below the EPA criteria of concern.
Figure 3.1 Current Whole Site Risk Contours

Figure 3.2 Proposed Whole Site Risk Contours

EPA LIMITING CRITERIA

<table>
<thead>
<tr>
<th>Within Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public open space</td>
</tr>
<tr>
<td>Commercial areas</td>
</tr>
<tr>
<td>Residential areas</td>
</tr>
<tr>
<td>Sensitive areas</td>
</tr>
<tr>
<td>Property Boundary</td>
</tr>
</tbody>
</table>
### Table 3.1 Explosion Overpressures from Ammonium Nitrate Solution Storage Tank Options

<table>
<thead>
<tr>
<th>Ammonium Nitrate Solution Tank Location Option</th>
<th>Inventory of Ammonium Nitrate (tonnes)</th>
<th>Distance from Ammonium Nitrate Solution Tank to Refrigerated Ammonia Storage</th>
<th>Distance from Ammonium Nitrate explosion to given effects:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Location</td>
<td>913</td>
<td>46</td>
<td>70 kPa: 130, 35 kPa: 180, 21 kPa: 250</td>
</tr>
<tr>
<td>Option 1</td>
<td>343</td>
<td>310</td>
<td>70 kPa: 94, 35 kPa: 130, 21 kPa: 180</td>
</tr>
<tr>
<td>Option 2</td>
<td>343</td>
<td>463</td>
<td>70 kPa: 94, 35 kPa: 130, 21 kPa: 180</td>
</tr>
</tbody>
</table>

Note: The overpressures above result in: 70 kPa - Assumed 100% Fatalities, 35 kPa - Near complete destruction of houses and 21 kPa - Onset of Fatalities & Ammonia Tank Rupture [HIPAP:4 1992].

Considering Table 3.1, it can be seen that the proposed locations and reduced inventories of the Ammonium Nitrate Solution Tank present no threat to the Refrigerated Ammonia Storage and hence reduce the onsite risk.

### 3.2. Kwinana Bulk Jetty

The risk profile for the proposed export of Bagged Ammonium Nitrate Prill (ANP) from the North Arm of Kwinana Bulk Jetty is considered within the total jetty risk, comprised of:

- The existing nine (9) Ammonia Transfers per year by CSBP;
- The twelve (12) ANP exports per year allocated to Dyno Nobel and,
- The proposed twenty-four (24) CSBP ANP exports per year.

The explosion risk from the proposed total thirty-six (36) ANP exports (limited to 4,000 tonnes per shipment) is cumulatively presented with the toxic risk contours (Figure 3.3). Accordingly the risk is demonstrated to lie within the tolerable if ALARP region according to the EPA criteria.

**Figure 3.3 Proposed Shipping Operations Risk Contours**

"Public Open Space" is the limiting criteria of concern with respect to Wells Park, yet there is 440m between the risk contour and the northern park boundary.
4. CONCLUSIONS

1. There is no substantive change in the offsite risk, other than a slight reduction in risk on the northern boundary.

2. Onsite risk has been significantly reduced due to the proposed relocation and reduction in size of the Ammonium Nitrate Solution tank. This action prevents any Ammonium Nitrate Solution Storage tank explosions damaging the Refrigerated Ammonia Storage tanks and causing subsequent ammonia releases, which reduces the risk profile for the whole site.

3. The QRA has not proven sensitive to the three proposed layout options assessed because they have no significant impact at the site boundary and are very similar when considered on the overall geographic scale. However all three options exhibit the benefits of relocation and the reduced inventories of the Ammonium Nitrate Solution Tank.

5. REFERENCES


